Science & Technology
Buffalo & Erie County Public Library
Lafayette Square
Buffalo, N. Y. 1420

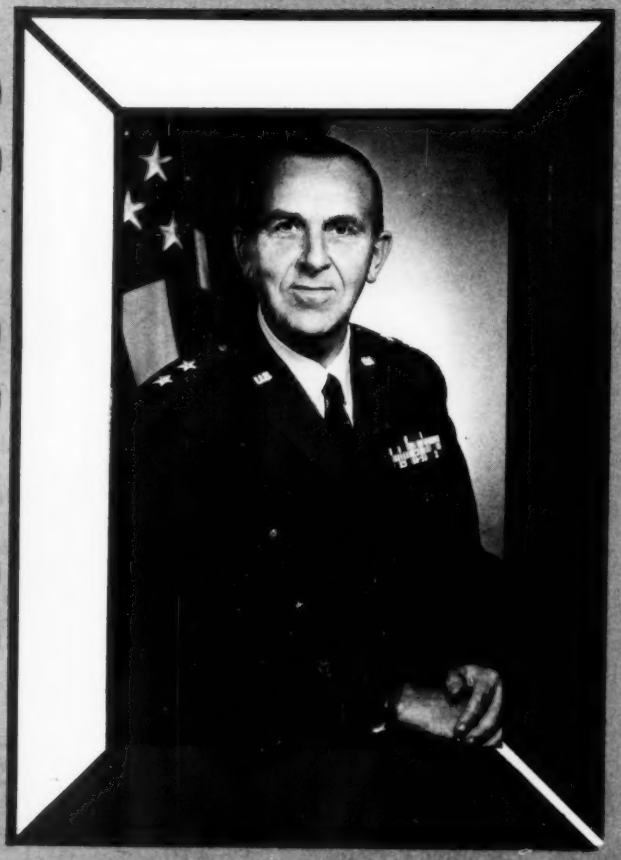
S+T

AIR FORCE

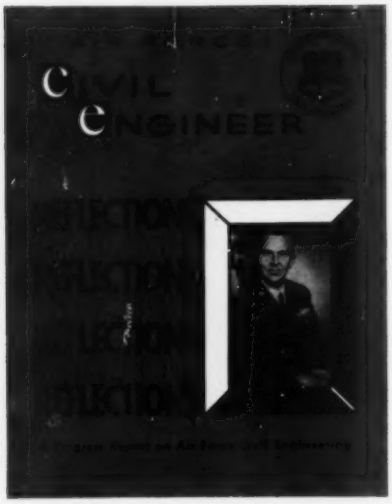
CIVIL ENGINEER

VOL. 13 No. 1 FEB 1972

REFLECTIONS



A Progress Report on Air Force Civil Engineering



REFLECTIONS—A progress report on the management systems within Air Force Civil Engineering begins on Page 1, and is presented on the occasion of the retirement of Maj Gen Guy H. Goddard, see Page 6.

USAF RECURRING PUBLICATION CIV ENG 85-1

VOL. 13 NO. 1

FEBRUARY 1972

COVER STORIES

1 • **Air Force Civil Engineering Management . . . A Progress Report**
by A. M. Crawford, Jr, PE

6 • **Reflections . . . Maj Gen Guy H. Goddard Terminates Distinguished Active Military Career**

FEATURES

9 • **Maj Gen M. R. Reilly Becomes 10th Director of Air Force Civil Engineering**

11 • **Simplified Plans and Specs**
by Maj Arthur P. Hahn, RA

14 • **An Open Discussion on the Prime BEEF Program**
by Capt Max W. Day, PE

17 • **How to Accomplish a Base Development Plan**
by Capt Robert L. Bell

19 • **Six Receive Company Grade Award**

22 • **BEAMS, The Multi-Purpose Tool**
by Capt Herbert L. Hollar, EIT

26 • **Forecasting and Accomplishing MFH Renovation Requirements**
by Capt William L. O'Dell, Jr

DEPARTMENTS

10 • AFCE Leaders You Should Know

16 • Fire Box

20 • AF / PREmphasis

21 • Worth Noting

Maj Gen M. R. Reilly
Director of Civil Engineering
Headquarters USAF

Col William D. Gilbert
Director
Civil Engineering Center

Editorial Staff

George K. Dimitroff
Editor

Roger F. Butler
Art Editor

Command Correspondents

Capt Ronald J. Zwolinski	AAC
Capt John Pellek	USAFE
Mr. Wallace H. Brown	AFSC
Col Alfred L. Pierce	ATC
Mr. Charles W. Anderson	AU
Col Roy D. Lemons	MAC
Col Tilman H. Bucher	SAC
Col Sydney E. Key	USAFSS
Mr. S. M. Carter, Jr.	CINCPACAF
Col M. B. Rubenstein	TAC

The AIR FORCE CIVIL ENGINEER is an official, non-directive Hq USAF departmental publication, published quarterly under provisions of Chapter 2, AFM 5-1. Its purpose is to provide timely information to Air Force Civil Engineering personnel relating to mission accomplishment; to assist them in solving problems and improving efficiency of operation; to communicate new developments and techniques; and to stimulate professional thought and development. The Journal is edited and published by the Civil Engineering Center, Headquarters U. S. Air Force. Contributions, suggestions and criticisms are welcome. Opinions expressed by individual contributors do not necessarily reflect the official viewpoint of the Department of the Air Force, the Director of Civil Engineering or the editorial staff. Final selection of material for publication is made on the basis of suitability, timeliness and availability. Address communications to: Editor, AIR FORCE CIVIL ENGINEER, (AF / PRECJ), Wright-Patterson AFB, Ohio 45433. Telephone Extension 74192. DISTRIBUTION: F. The Journal's annual subscription prices are: $1.00 domestic, $1.25 foreign, or 25 cents a copy. Mail check or money order to: Superintendent of Documents, Government Printing Office, Washington, D. C. 20402. Back issues will be furnished when available.

Air Force Civil Engineering

Management

A Progress Report on:

- ✓ Mission Support
- ✓ Improved Methods
- ✓ Advances in Technology
- ✓ Economy of Operations
- ✓ Support for People
- ✓ Future Programs

During the past four years, Air Force Civil Engineering has taken on new direction. The emphasis has been on the AFCE as a manager as well as an engineer. The impact has been tremendous. Civil Engineering is proving its worth to the Air Force.

A Progress Report on AFCE Management

by A. M. Crawford, PE

The May 1968 issue of the *Air Force Civil Engineer* contained Maj Gen Guy H. Goddard's first message as Director of Civil Engineering. These initial comments were devoted to a review of basic civil engineering objectives and philosophy. Emphasis was placed upon future requirements for strong mission support, improved methods of operation, advances in technology, increased economy of operations and support for people. The underlying theme was the necessity for finding better ways of doing our job plus engendering management awareness throughout civil engineering.

Mission Support

The **RED HORSE** program, originally established to support contingencies in SEA, has continued to develop as a viable force capable of furnishing civil engineering support to Air Force and allied combat units worldwide. Coincident with reduction of our forces in SEA, three RED HORSE squadrons were returned to the CONUS, while one remains in Vietnam. The 554th CES continues to provide in-country support for urgent requirements and will be involved in retrograde of relocatable facility assets. Meanwhile, active training programs have been instituted for CONUS-based RED HORSE squadrons to insure their capability to provide mobile rapid response to support tactical air, special air warfare, contingency and disaster requirements around the globe. The RED HORSE mobility capability has recently been translated into expansion of support for mission requirements in the CONUS and Europe. Examples of current projects are the forward firing barricades in Europe and the construction of facilities at the Blair Lake range in Alaska.

During the past four years, great strides were made in upgrading the manning, training, mobility and performance of **Prime BEEF** teams. A highly effective field training program has been developed to provide mobile teams with instruction in security, self-preservation, austere living conditions, and establishment and operation of forward operating bases. Additionally, a rigorous program was instituted to gauge the effectiveness of individual teams through the use of Deployment Capability Inspections and Recovery Capability Inspections. Considerable emphasis is also being placed upon improving the proficiency of Engineering (E) teams which now provide the Air Force with a mobile professional engineering force to complement recovery, contingency, heavy repair, and tactical support requirements—anywhere, anytime.

Our mission support capability has been expanded by increased emphasis placed upon **Site Selection Teams.** Teams from the Civil Engineering Center provide a quick response capability to site selection requirements in support of tactical movements, planning studies, topographic surveys and associated activities to promote the flexibility of Air Force operations. Engineering assistance for the tactical mission has been enhanced by initiation of the **Bare Base Development** capability which continues to make steady progress.

Development of suitable shelters, vehicles, equipment and procedures continues to increase the capability of Air Force engineers to be airlifted to any bare base in the world and provide necessary facilities within days to sustain tactical operations. Mobility and contingency planning have also received added emphasis to upgrade the AFCE capability to respond to a wide spectrum of mission support requirements.

Improved Methods

During the past four years, civil engineering entered a new era of philosophies, concepts and systems designed to promote the best possible engineering support to the Air Force at minimum cost. Starting with a redefinition of Civil Engineering Objectives, a Management Review Program was developed to provide Base Civil Engineers (BCEs) with a standardized tool for evaluating their effectiveness and progress. This **Management Review Program** was then integrated with AFCE Objectives and BALANCE to provide a closed loop, top-to-bottom system oriented toward **management by objective.** In order to provide the timely feedback necessary to keep this system alive, the charter of the **AF/PRE Management Review Team** was recast last year to provide a means of evaluating: (1) Use and effectiveness of directives, systems and programs; (2) Resource capability of BCE organizations; (3) Support to BCEs by other organizations, and (4) Major problems adversely affecting BCE performance. During 1971, team efforts have been devoted to follow-up of major problems identified during the last cycle of base visits.

Recent success in implementation of **BEAMS** now provides civil engineers with timely information in suitable formats designed to increase management

SKIP CRAWFORD is an Industrial Engineer in the Management Division, Directorate of Civil Engineering, Headquarters U. S. Air Force. He holds a bachelor's degree from Virginia Military Institute and a master's degree from George Washington University. A graduate of the Air Command and Staff College, he is a registered Professional Engineer in Massachusetts.

effectiveness in the face of increasing workloads and diminishing resources.

Application of computer technology has also resulted in development of **Automated Total Programming,** now in various stages of implementation throughout the Air Force. A need for increased responsiveness to constantly changing military missions led to exploration of *computer programmed base master planning*—a possibility which offers much promise.

Introduction of **Project (design criteria) Books** in recent years has reduced the cost and time for project design. Emphasis on use of simplified plans and specifications and two-step procurement also decreased the number of dollars and hours devoted to project design. Improved identification and validation of manpower requirements have resulted from extensive civil engineering participation in the Management Engineering Program (MEP) implemented in recent years by the Directorate of Manpower. More intelligent management of available manpower resources is now possible as a result of the effort expended on the program by civil engineering at base, major command and Air Force levels.

One of the most fruitful recent achievements has been the establishment of a **Civil Engineering Center** at Wright-Patterson AFB. This organization, a field extension of the Air Staff, now has assigned more than one-third of all Directorate of Civil Engineering personnel. It is service oriented, providing field assistance to all Air Force commands, mostly through the medium of specially trained and equipped teams. Areas of responsibility include such mission support functions as fire / crash rescue, airfield pavements evaluation, runway roughness measuring, aircraft arresting systems and airfield ice control. Others are utility systems condition investigation, procurement of modular facilities, forestry, applications engineering and value engineering. Structuring and tasking of the RED HORSE and Prime BEEF forces for civil engineering mobility is coupled with unit training through the Field Activities Branch. A materials testing laboratory capability is now in being at the Center and the mobile labs are becoming well known as the airfield evaluation program gains momentum. The no-notice visits of the Fire Evaluation Teams are already paying off handsomely.

Establishment of the Center to provide for all commands those services which no one command could effectively perform for all others has made it possible to accomplish advances we only talked about in previous years. Dramatic improvements in engineer equipment, crash-rescue vehicle programs, readiness of fire organizations at many bases, interface with the R&D community, new developments for modular relocatable facilities, civil engineer participation in contingency planning, readiness of Prime BEEF teams in the active reserves and ANG forces, new applications of the hardened aircraft shelter, and many other areas have already resulted from the efforts of civil engineers at the Center. Even greater benefits are anticipated in the future.

Since 1968, improved management attention and decision making on programming of repairs, modification and replacement of facilities has been improved by implementation of the **Engineer-Manager Concept,** a key element of Total Programming. This program capitalizes on the expertise and judgment of professional engineering personnel in base-level decision-making concerned with the millions of dollars spent annually for construction, operation and maintenance of Air Force real property.

Advances in Technology

An **Applications Engineering Program** has been established to determine whether new methods and materials developed by industry can be effectively used by AFCE. Field tests provide the basis for performance studies and economic analysis to determine whether use of a product or procedure will reduce costs or improve operations, etc. Information is also being accumulated from similar studies made by other agencies.

Civil engineering research and development has been stimulated by programming one and five year R&D requirements, promoting greater standardization of construction materials and by improved liaison and coordination with other government and industrial agencies. The potential benefits from research efforts were sufficient to justify a research funding increase for this year of almost three times the previous annual budget.

A need to counteract rising construction costs, provide a capability to relocate facilities economically in response to mission changes, and reduce the influence of seasonal weather on construction, led to investigation of **Industrialized Construction.** When feasibility studies revealed that this technique could reduce unit costs, and increase both the volume and quality of production, industrialized construction methods were incorporated into both the regular MCP and Air Force Family Housing programs for FY 1972.

cont'd next page

Management *cont'd*

Interest in this concept has been reflected in the strong emphasis recently placed upon fabrication of modular facilities for the Air Force by industrial firms. Over 50 firms expressed interest in participation in Phase I of the $69 million Family Housing package. About $40 million of the regular FY 1972 MCP will be spent for troop housing, administrative / operations / training facilities and for warehouses using industrialized construction techniques.

Reduction in air and water pollution, plus noise abatement, erosion control and forestry management have been enhanced by establishment of an **Environmental Protection Group.** Much emphasis has been placed upon identification of the sources of pollutants generated by Air Force activities, and vigorous action is now being taken to accomplish fuel conversions, plant and equipment modification or procedure changes necessary to eliminate discrepancies noted.

Research & Development crossfeed and results from applications engineering efforts resulted in improved vehicles and equipment to support fire protection, snow removal and bare base development. Revetments and aircraft protection shelters have been upgraded by redesign and use of improved materials. Application of advanced technology has also been reflected in increasing the skid resistance of airfied pavements.

In order to take maximum advantage of the technological expertise available within AFCE, an in-house consultant file has been established. Information from this centralized register is used to locate military or civilian personnel who possess special skills required to cope with unusual technical problems which arise at Air Force installations throughout the world.

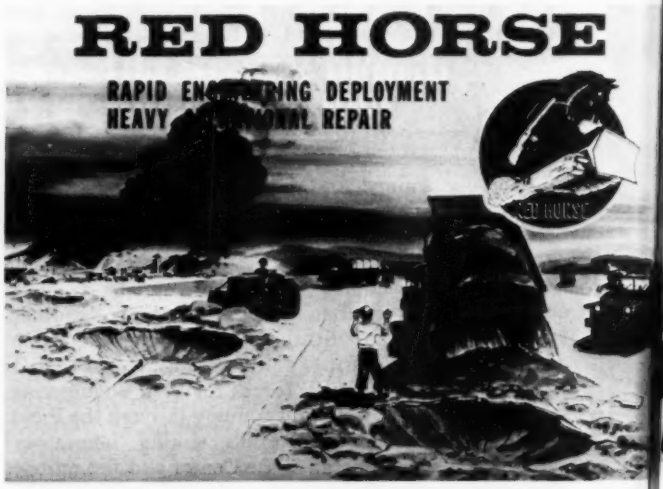
Economy of Operations

With few exceptions, recent improvements in methods of operation and advances in technology have been oriented toward increasing productivity of the work force. At the same time, continued reduction in available resources stimulated establishment of procedures and programs designed to achieve optimum economy consistent with effective mission support. Formal training provided to architects and engineers in the principles, techniques and applications of **value engineering** has already returned a payoff of many thousands of dollars. One promising outgrowth of value engineering is the current program aimed at reducing facility life-cycle costs.

To combat escalation of construction costs, a "turn key" approach to family housing construction was developed. The "Request for Proposal Procedures" employed utilizes the "two-step procurement" approach to contracting—thereby capitalizing upon use of the expertise developed by industry in design and construction of good quality houses with available funds. Savings in design manhours and dollars have also increased due to expanded use of simplified plans and specifications. SIOH costs associated with management of the MCP by the Corps of Engineers and other construction agents, including in-house forces have been driven down by a concerted management effort.

Austere budgets and rising costs led to establishment of a **Base Use Study Team** to evaluate utilization of facilities, conservation of utilities and resources plus facility disposal actions. Findings and recommendations made by this team have generated realignment of facility use, building disposal or pickling with attendant savings in maintenance and utilities costs. Air Force dollars have also been saved by use of *exchange* as a means of acquiring necessary land. In this case exchange of public domain land has been made for sites required to accomplish a specific purpose. This procedure conserves funds while satisfying mission requirements.

The goal of maximizing economy of operations has been served well recently by favorable trends in the cost of fire loss. Steady improvement in this area is a payoff for aggressive research, training and



management. Economy of operations has been increased by numerous other programs in addition to those already described. Conversion of selected functions to contract operations, establishment of a Forest Management Program, stimulation of an improved vehicle buy program, and acceleration in disposal of unrequired real property have all contributed to the AFCE objective of providing optimum engineering support as economically as possible.

Support for People

Improvements in mission support, management, operational procedures and economical performance during the past four years have been matched by active programs to upgrade the quality of living for Air Force people.

High on the list of such "people projects" stands recent concentrated efforts to expand and modernize

the inventory of Family Housing. Diminshed housing "down time" between occupants continues to reduce out of pocket dollars paid for temporary off-base quarters by personnel awaiting government housing.

The promising beginning of a worldwide dormitory refurbishment program, plus expeditious processing of projects to upgrade dining halls, recreation facilities and other activities which support Air Force people and the "All Volunteer Force" concept have received impetus from renewed civil engineering attention to projects for people.

Progress has also been made in recent years toward improving the professional growth of people within the civil engineering family. Establishment of **PALACE BLUEPRINT** provided civil engineering officers with a "people oriented" program designed to provide total career management. Continued advancement toward Prime BEEF objectives brings the civil engineering force closer to a balanced civilian / military mix and promotion of equitable career development opportunities. The need for improved management and utilization of personnel at base-level recently led to stabilized tours for BCEs.

Additional emphasis upon attracting qualified young engineers resulted in establishment of **Concrete Youth,** an intensified program to provide accelerated professional growth and advancement to recent engineering graduates who are employed in civil engineering.

Development of Standardized Position Descriptions for 33 key positions was another important breakthrough for civilian members of our work force. Standardization of responsibilities, work content and qualification requirements of these positions will furnish the framework for future career planning and development as well as continued growth in the professional qualifications of civilian engineers. An important by-product of this program was correction of grade imbalances and promotion of a number of personnel to levels commensurate with their responsibilities and qualifications.

In recent years, educational opportunities for all civil engineering personnel have been considerably broadened. In addition to expanding technical training programs available through the Civil Engineering School and the ATC Technical Training Centers increased opportunities have been provided for education with industry, enrollment at civilian institutions, correspondence courses, etc.

Recognition of the importance of the human side of our business stimulated interest in additional training for managers at all levels in human relations, communication and similar subjects related to answering the needs of the people who constitute our work force.

More attention has also been given to recognition of outstanding performance through expansion of the Civil Engineering Awards Program and increased publicity for outstanding units and individuals.

Future Programs

Any record of civil engineering progress since May 1968 would be incomplete without reference to several excellent programs conceived during this time frame which are still in various stages of development.

Continued improvements and expansion can be expected in protective construction for weapons systems and the facilities which support them. After a promising start, industrialized construction of modular and relocatable facilities will undoubtedly be expanded.

Computer aided design capability and automated specification retrieval systems will become accepted as useful time and cost saving tools for engineers in the future.

The impending implementation of **Centralized Family Housing Management** Offices should improve management of Air Force family housing assets and improve service to occupants.

Implementation of the **Visible In-Service Work Plan Concept** plus the **"Controller mode"** of managing the work force should rejuvenate our Production Control Centers and increase productivity further. Extensive testing of **Contractor Operated Civil Engineer Supply Stores,** has clearly shown the benefits this system can offer in terms of responsive supply support.

"The Past is Prologue"

The words above are inscribed over the entrance to the National Archives Building. They serve as a reminder that results achieved today and future developments too are foreshadowed by events which have gone before.

Most civil engineering accomplishments over the last four years were strongly affected by basic philosophies and objectives redefined by General Goddard at the onset of his term as Director of Civil Engineering. His vision, innovative spirit and dynamic leadership inspired or shaped most of the developments described in this article. It is axiomatic that General Goddard's influence upon civil engineering doctrine, concepts and attitudes will endure for years to come.

REFLECTIONS

Major General Guy H. Goddard Terminates Distinguished Active Military Career

The passing of 1971 marked the conclusion of the distinguished active military career of Maj Gen Guy H. Goddard, the ninth Director of Air Force Civil Engineering, who retired 31 December 1971.

A 1941 graduate of the Military Academy at West Point, General Goddard saw World War II action in New Guinea, Moratai in the Dutch East Indies, and the Philippines, where he commanded Army Aviation Engineer Battalions in the construction of combat support airfields, cantonment facilities, roads and bridges.

After transferring to the Air Force in 1948, he later served as the Caribbean Air Command Civil Engineer, followed by a 4½ year stint at Ft Wolters AFB, Texas, where, as the DCS / Operations of the Aviation Engineer Force, he was responsible for organizing, equipping, training and deploying forces to conduct troop construction operations worldwide during and immediately following the Korean War.

Assigned to Headquarters in 1957

In 1957, General Goddard was assigned to Headquarters U. S. Air Force where he began what was to become a close and long standing association with, and interest in, Air Force family housing. This four-year tour was highlighted by his role as Chief of Housing Construction, which involved the programming, design, mortgage financing, construction management and legal closing of the Capehart housing program, and which also included the direction of a major Wherry housing renovation program. For his efforts in this capacity, he received his first Legion of Merit.

General Goddard traveled to Wright-Patterson AFB in 1962 and became the Civil Engineer at Headquarters Air Force Logistics Command where he served with distinction for three years. For his outstanding management efforts in this capacity, he was awarded a second Legion of Merit, and it was here that he was promoted to brigadier general.

Returning to the Pentagon in 1965, General Goddard became the Deputy Director for Construction, and for almost three years directed the major construction program buildup of air bases in Southeast Asia. During this period he was awarded his third Legion of Merit for his role as the Air Staff monitor of the $52 million Turn Key construction of Tuy Hoa AB, Vietnam. During this period, General Goddard was also intimately involved in the design and construction, and earlier the defense before Congress, of the $150 million worldwide Air Force aircraft protective shelter program.

In May 1968, General Goddard became the ninth Chief of Air Force Civil Engineering and served for 3½ years in that capacity until his retirement, thus capping a truly distinctive 30-year military engineering career.

The 1968-71 era posed an enormous management challenge to Air Force Civil Engineering. It was an era of economic inflation and diminishing resources; one that saw the annual Air Force facilities Operations and Maintenance (O&M) budget climb to $1.2 billion, yet

also saw the worldwide civil engineering work force diminish by 20 percent, or 20,000 people, without a corresponding reduction in workload. It was an era fraught with almost crippling resource constraints, yet it saw the Air Force physical plant—and Air Force Civil Engineering—continue to grow and improve in quality, if not in numbers. General Goddard's personal contributions during this era were many and varied.

Institutes Positive Controls

It became apparent that better management of the Military Construction Program (MCP) dollar was needed, and new construction techniques would be required to improve the yield of such dollars. General Goddard instituted the use of positive and systematic controls on the timeliness and cost of MCP projects, driving down design and construction management overhead costs, and freeing dollars for application against additional design and construction requirements. Increased use of simplified plans and specifications, two-step procurement, and the first major Air Force thrust into the realm of industrialized modular construction characterized our design and construction efforts under General Goddard's leadership.

Continuing government-wide force reductions during these years accentuated the mandate to improve the use of available resources as never before. Contract dollars for O&M and minor construction, seriously diminished by inflation, had to be better justified and

cont'd next page

REFLECTIONS

cont'd

applied systematically against facility requirements in a manner which would accrue the greatest overall benefit to the Air Force. Total Programming and the Engineer-Manager concept were consequently generated to meet the challenge of satisfying the requirements despite severely constrained fund availability.

Even more crucial, however, was the need to increase the productivity of in-house resources. The entire spectrum of civil engineering management, from Headquarters U. S. Air Force on down, was subjected to increased scrutiny in the search for better ways of doing our business. General Goddard recognized that the need for management by objectives, through management-by-exception techniques, was essential to this effort, and BALANCE soon evolved into a top-to-bottom Management Review Program of policy objectives, performance goals, and standard management data tables oriented toward the Base Civil Engineer, thus providing for the first time a standardized, comprehensive, self-evaluation technique, available to virtually every civil engineering manager in the Air Force.

Recognizes Importance of ADP

During these years, General Goddard recognized the importance of automated data processing to effective management. Consequently, he directed a rapid acceleration of the planned BEAMS field implementation schedule, knowing that the long-range economic advantages of doing so would far outweigh the difficulties encountered in expediting this milestone effort. MCP and O&M project status reporting was vastly overhauled and streamlined to permit improved fund control and management of these vital contract programs. Integration of basic data files under BEAMS, and the automation of Total Programming and the equipment maintenance program were also undertaken during this period. All of these developments in the application of data processing technology have prepared Air Force Civil Engineering well for the management challenges facing us in the 1970s.

In the area of personnel management, General Goddard was the driving force behind the standardization of key civilian position descriptions which greatly enhanced civilian career development opportunities. He promoted numerous actions to improve our military force management, both officers and airmen alike, and his concern for adequate training of our personnel led to many new and revised training quotas and curricula.

At a Society of American Military Engineers meeting, the four chiefs of engineering within the Armed Services posed for the camera. In addition to Maj Gen Guy H. Goddard, third from the left, they are (from the left) Capt Charles Bittenbring; Maj Gen F. J. Clarke; and RADM W. M. Enger.

General Goddard was responsible for the creation of the Civil Engineering Center as we know it today—the field applications and support agency of the Directorate of Civil Engineering. It seems remarkable that until only recently we did not have the diverse field assistance capability now provided by the Center—in aircraft / crash rescue fire evaluation and assistance, pavements evaluation, corrosion control, vehicular equipment management, site selection services, contingency planning, mobility force management, and numerous other technical, procurement and management support services.

There can be little doubt that the influence of General Goddard's direction will be felt for years to come. His exceptional capacity for work, his fierce determination and relentless pursuit of excellence, and his attribute of decisively meeting every challenge headon are qualities we might all do well to emulate.

CE

On a visit to the Civil Engineering School at Wright-Patterson AFB, Ohio, the camera caught the Director and Deputy Director of Air Force Civil Engineering during a break. Maj Gen Guy H. Goddard is at the left and Maj Gen M. R. Reilly is at the right.

Major General M. R. Reilly

Becomes 10th Director of Air Force Civil Engineering

In the August 1968 issue of the *Air Force Civil Engineer* journal, Maj Gen M. R. Reilly (then a Colonel) was described as an officer whose Air Force career had been one of facing exciting challenges. The article traced his career through a series of successively responsible positions he had held and noted he was facing still another one as he assumed the role of Deputy Director for Air Force Civil Engineering.

Almost four years have passed since that article was written and today, General Reilly is at the threshold of what might be considered the greatest challenge of his entire 27-year career. On 1 January 1972, he became the 10th Director of Air Force Civil Engineering.

In the capacity as Director of Civil Engineering, he will provide managerial leadership and technical guidance to the field in the areas of facilities programming, design, construction, and operations and maintenance; utilities and related services; real property acquisition, management and disposal; fire protection and aircraft crash / rescue services; environmental protection; and contingency / mobilization planning. Translated into manpower and dollars, he is the Senior Staff engineer for a work force that employes over 80,000 people to sustain a physical plant inventory having a current replacement value in excess of $40 billion.

* * *

General Reilly was born in Great Falls, Montana, on 27 August 1921. The family moved to Texas two years later when his father became the manager of one of the largest cattle ranches in the United States. General Reilly attended public schools in Matador, Texas, and graduated from high school in 1938. Intent on becoming an engineer, he attended preparatory school for two years in Lake Forest, Illinois, before enrolling at the University of Colorado in 1940. In addition to studying engineering, he played football and was selected all-conference quarterback in 1942.

The next year, he entered the Army Air Corps and received his pilot wings and commission as a second lieutenant at Eagle Pass, Texas, in 1944. During the next year, he served as a flight instructor at Eagle Pass, followed by crew training in B-24 and B-29 bombardment aircraft. He was flying B-29s from Saipan when the war ended in August 1945. He was separated from active duty in March 1946 and returned to the University of Colorado where he received his bachelor's degree in civil engineering in June 1947.

In October 1947, he accepted a regular commission and returned to active duty as a first lieutenant at Langley AFB, Virginia in December 1947. He served in various base engineering jobs at Langley AFB until August of 1948 when he was reassigned to the Far East. For the next two and a half years, he served as a staff engineering officer at 20th Air Force Headquarters on Okinawa and later with Headquarters Far East Air Force in Tokyo, Japan. Much of his time was spent managing facilities rehabilitation contracts on Okinawa and in the design and construction of new airfield facilities in Japan. He was promoted to captain in June 1950.

General Reilly returned to the United States and entered Purdue University in June 1951 and was awarded a master of science degree in civil engineering in August 1952. He was promoted to major while attending the University. For the next four years, he served as an instructor at the Civil Engineering School at Wright-Patterson AFB, Ohio. He was then advanced in grade to lieutenant colonel in April 1956.

Following a year at the Air Command and Staff School, he was transferred to Madrid, Spain, and assigned to the Directorate of Construction, Joint U. S. Military Group. As Chief of the Air Base Branch and later as Chief of the Engineering Division, he was intimately involved in the Spanish bases construction program. In the summer of 1960, he returned to the United States and entered the Air War College. He was promoted to Colonel in April 1961.

From July 1961 until July 1966 General Reilly was assigned to the Directorate of Civil Engineering, Headquarters U. S. Air Force, where he served successively as Chief of the Strategic Missile Construction Branch, Assistant Chief of the Construction Division, and Deputy Chief of the Programs Division. He then was named Director of Civil Engineering at Headquarters Air Force Systems Command, Andrews AFB, Maryland.

In June 1968, he returned to Headquarters U. S. Air Force in the capacity of Deputy Director of Civil Engineering. He was promoted to brigadier general on 1 August 1968, to major general on 1 August 1971, and became Director of Civil Engineering on 1 January 1972.

A Command pilot, a registered Professional Engineer in Colorado, and an avid sports enthusiast and handball player, General Reilly is a member of several professional societies. His military decorations include the Legion of Merit, Bronze Star Medal, and Air Force and Army Commendation Medals.

AFCE Leaders You Should Know ... James F. Boatright, PE

Over a century ago, Horace Greeley penned the following words of advice in an editorial in his newspaper, the *New York Tribune:* "Go West, young man, and grow up with the country." The challenge was accepted by the adventurous, the high-spirited and the hard working. For many of those that did, the move proved a success; some grew in fortune while others grew in fame for their exploits. Apparently, the advice was good.

However, if today you were to apply those "good" words of advice to James F. Boatright, they wouldn't fit. He *left* the West and came East instead!

The implication is not that Jim doesn't accept advice—he does. The fact is he is just as adventurous, high-spirited and hard working as those who were motivated to act by the challenge of that editorial years before. These attributes are proved by his obvious zeal in attempting the untried in any challenge he encounters. He thrives on risk and firmly objects to performance "according to the past." He explains.

"Doing as we have always done is an antiquated way of performing. Just because we faced a situation a certain way last year does not mean it should be handled again this year the *same* way. I do not hold to the often heard plea, 'But that's the way we've always done it.'

"There must be that risk, that attempt to try something new. If a new idea has application, try it! In other words, don't get off track just because someone is going to run into you."

With such a credo, it is easily understood why the 38-year-old native of Colorado who is a registered Professional Engineer in Washington, D. C., fills a position of much more than routine importance. Currently, he is the Deputy Chief, Plant Engineering Division, Directorate of Civil Engineering, Hqs U. S. Air Force.

In this capacity, he shares direction of the Division responsible for the development and issuance of technical criteria and guidance for the design, construction, maintenance and repair of all Air Force real property facilities and systems worldwide, except family housing. Translated into dollars, this physical plant has an initial acquisition value of over $16 billion and a replacement value of almost $40 billion. Annually, almost $350 million is spent for new construction, and the annual expenditure for maintenance and repair by contract of these facilities is between $85 and $100 million.

The Division also initiates and directs the actual execution of design and construction on a major portion of the new construction program, and has the responsibility for providing the technical guidance for the operation of utility systems and the purchase of utilities worldwide with a yearly expenditure of almost $410 million.

Admitting that these responsibilities—when brought together—comprise the biggest challenge he has ever faced, he identified those that he believes are the most vital toward realization of the AFCE mission.

1) Acceptance of the Engineer-Manager concept as a reality in AFCE. "As our facilities age with each passing year and our dollars decrease, the potential impact on our physical plant is critical. If we are to survive, we must apply professional engineering judgment to each dollar we spend. I believe the complete implementation of the Engineer-Manager concept will become a reality but it will take a concerted effort by local management and the traditional dedication of our professional engineers."

2) Acceptance by OSD and Congress that the Air Force should be design / construction agent for some of its new facilities. "This is a matter of basic economics. The Air Force has the talent and the personnel to manage the design and construction of many of its own facilities—and it should. The hard fact is that economy is more important than heritage."

3) Acceptance of innovative processes in the design and construction of Air Force facilities. "It is time to overturn the tradition of designing everything in detail and then building. This is not wise in our current escalating economy. Two-Step Procurement, Industrialized Construction and Simplified Plans and Specifications are some processes by which we are attempting to do away with old, costly methods."

He forecast that within the next five years, AFCE will be facing a tremendous challenge. As the age of the physical plant grows older and the economic squeeze becomes tighter, the problem will be in how we take care of these facilities.

"If we apply new technology and management innovation wherever possible and exercise sound engineering judgment in the dollars we spend, we will prove the worth of civil engineering to the Air Force. This is what I call real professionalism."

Jim received his bachelor's degree in civil engineering from the University of Colorado. Upon fulfillment of his military obligation as an officer in the Army, he became a design engineer with the Bureau of Reclamation in Grand Junction, Colorado. His move eastward began when he went to Salina, Kansas, as a resident engineer in the Atlas missile program with the Army Corps of Engineers, and then to a position with the Army Research Lab at Ft Belvoir, Virginia. He joined AFCE in 1966 as the Air Staff project engineer for construction in Vietnam, playing a significant role in the historic Turn Key project, Tuy Hoa AB. "My decision to join AFCE was the smartest move I have ever made," he says.

AFCE is fortunate that he did.

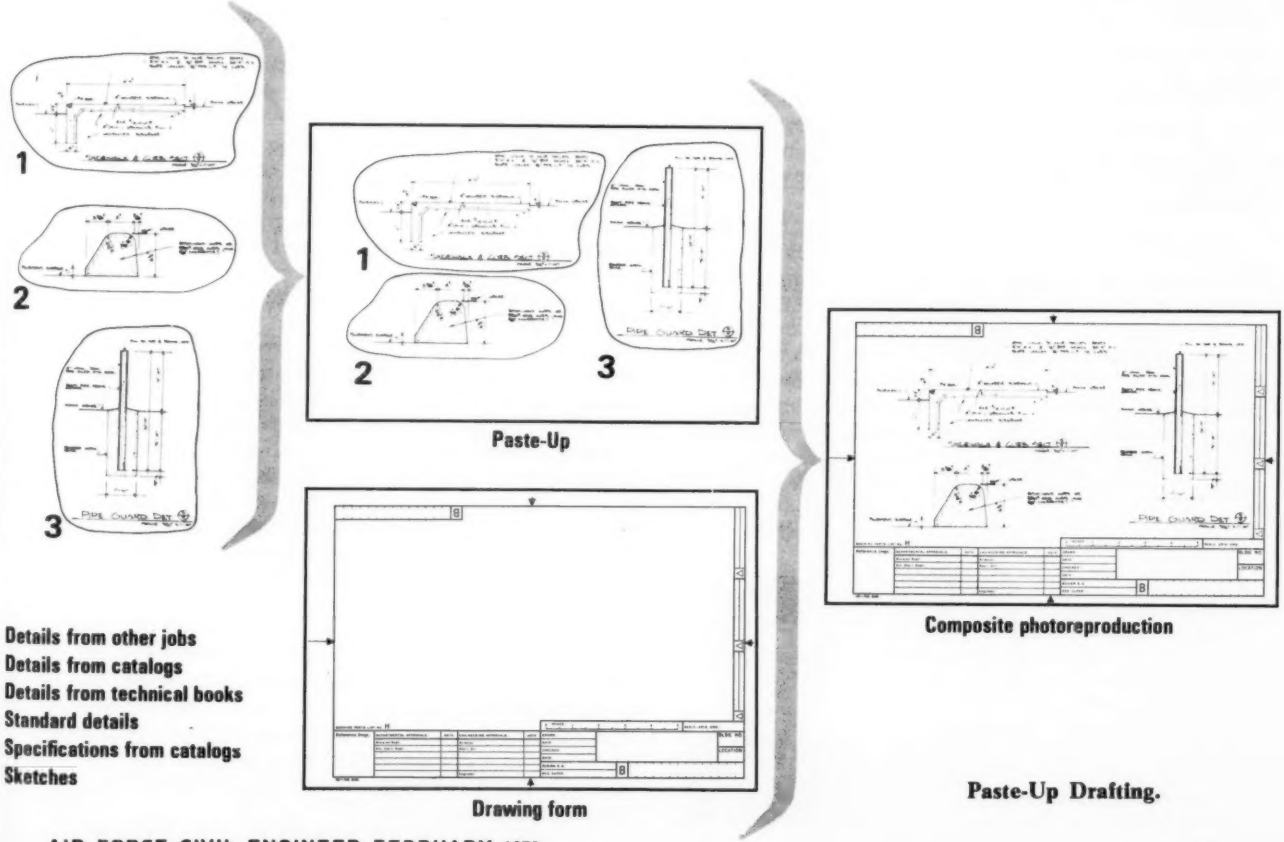
Simplified Plans and Specs

by **Major Arthur P. Hahn, RA**

Many members of the engineering and construction team are still "BC" (bucking change) in accepting new drafting tools and techniques. Turn Key, Two-Step, Life-Cycle Costing, Modular and Industrialized Construction are words and techniques that are becoming familiar to the Air Force architect and engineer. They are procurement and construction concepts that take advantage of the technology of the seventies. But, are we keeping pace as far as design techniques are concerned? We may be creating a bottleneck by not trying a simplified approach to design.

Hold it! Don't flip that page! I know what's going through your mind. Something like, "What is a simplified plan and spec? I thought they all were supposed to be simple." I share your view. At the Civil Engineering School, we see over 1000 Air Force Civil Engineers each year and we have discussed the subject with many of the experienced base and command

cont'd next page



Paste-Up Drafting.

engineering and construction people. Guess what? Nearly every engineer and architect has his own idea of what a simplified plan and spec is. They say, to paraphrase the Mad Hatter of Alice in Wonderland, "Simplified plans and specs mean just exactly what I want them to mean!"

However, a common thread of agreement does run through the group. First, they agree that the basic intent of a design document is communication. Communication between the designer, procurement officer, bidders, contractor, inspector and, probably most important, the tradespeople. Second, they agree that the more straight-forward the document, the better. They should be brief, clear and concise. Third, they agree that a successful simplified technique should use our design manpower where it really counts—on creative tasks. An engineer should devote maximum time to thinking through ideas and making design decisions rather than spending a lot of time getting the design documents completed.

Re-invention of Wheel?

We find the wheel being re-invented time and again. In quest of simplified plans and specs, a base on the West Coast painfully develops a one-page drawing and spec technique while a base on the East Coast has been using that method since the mid-fifties and has extensive experience and advice to offer so that pitfalls can be avoided. And I bet that every "innovation" I mention is being used by some of you. The problem is getting the word out. So let me illustrate several approaches with which you may not be familiar.

The composite drafting technique is normally associated with simplified plans and specs. Either put the specs on the drawings or reduce the drawings in size and include them as part of the specs. This method best fits the mold of the "one or more simple drawings" definition given in **AFM 88-29.** It has the added benefit of using your existing reproduction equipment to run the prints. But why stop here? Modern technology is now progressing rapidly and drawing reproduction technology is no exception. Now, photography is adding a whole new dimension to the drafting room. It can be as valuable as the drafting board and tee-square, and save you manhours too!

Scissors drafting uses the motto: "If it's been drawn once, don't draw it again." Details from similar jobs, cut-outs from catalogs, printed specification sheets and photographs which show the work area can all be cut out, pasted or taped to a blank drawing format and reproduced photographically to make a new drawing. In fact, the *AIR FORCE CIVIL ENGINEER* journal was made using this technique. The photographic process takes care to give you excellent line weight, and the final result is printed on a top quality drawing surface. Neither tape nor the edges of the pasted-up drawing will be photographically reproduced.

Photography Offers Benefits

Photography offers the base organization many benefits. It can be used to "restore" creased, brittle and stained record drawings. The camera actually improves original line quality of old sepias. This feature can make your as-built drawing file like new. A photo-drafting technique can be used which incorporates close-range photos of existing facilities right on the drawings. These photos can be annotated to call out, or further explain, items of work to the contractor. In this way, the illustrative value of the picture is taken into the design process. Color can be added to "punch out" or separate complicated utility systems or new from existing work. Mechanical, electrical and architectural work can be clearly seen when color separated. Scale can be changed photographically so half-size, quarter size and pocket-size prints can be made.

Don't get the idea that scissors drafting and photodrafting limits creativity since you use scissors and tape. Nothing could be further from the truth. By using this technique, a designer eliminates much of the tedious time-consuming re-drafting and checking of prints required when details and floor plans are retraced. That time can be directed to Engineer-Manager and other tasks requiring full professional concentration and creativity.

One major air command is trying this design technique and is evaluating its potential application Air Force-wide. A variety of in-house design projects which are typical of the operation and maintenance projects found at the average base, were chosen. Early reports indicate what private industry has discovered. Savings in drawing and engineer man-hours are emerging. These manhours are being re-directed to Engineer-Manager duties and other design projects. In addition, intangible dollar savings result when a bidder can clearly see what is to be done.

Don't be frightened by the technicalities of this method. I suggest you get in touch with a local "blueprint" company. Chances are they are well versed in photo-drafting and can review your drafting and reproduction procedures, in light of the latest photo-reproduction methods. A statement of work for non-personal services can then be developed through your Base Procurement Office.

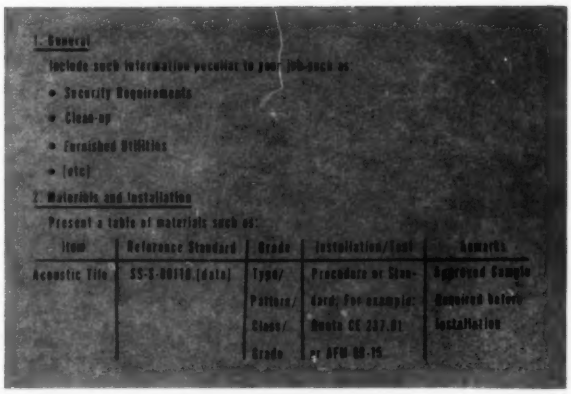
MAJOR HAHN is the Deputy Director of the Civil Engineering School, Wright-Patterson AFB, Ohio. He received his bachelor of architecture degree from Illinois Institute of Technology and his master of architecture degree from Oklahoma State University. A Registered Architect in Washington and an Engineer-in-Training in Oklahoma, he holds membership in several professional societies.

The applications are limitless and, doesn't the technique communicate, get straight to the point and use engineering manpower where it counts?

Another technique, radical in its approach, is freehand drafting. It saves manhours in the drafting section. Tee-squares, triangles and scales are discarded. The designer sketches details on thin buff paper laid over a gridded sheet. The sketching scale is large (3" - 1' -0"). These sketches are then placed on a blank linen sheet and fixed with rubber cement or taped. The sheets are then photographed and photographically reduced. The result is a top notch drawing that is hard to differentiate from triangle and tee-square quality. Industry reports savings on the order of 20 percent in drafting time when this method is used. The design team then doesn't spend a lot of time turning sketches over to draftsmen who "straighten out the lines." Large jobs as well as small operations and maintenance projects can be handled this way.

In both scissors-drafting and sketch working drawings a multitude of benefits result. To name a few: draftsmen don't have to retrace work, mistakes caused by copying details are reduced and offset printing costs are much cheaper than conventional blueline printing. Quality improves and man-hour effort decreases. Seems worth a try.

Most bases now have a microfilmed engineering and architectural library available. These library files are up-to-date, easy to use repositories of manufacturers' and vendors' catalogs, guide specifications, federal specifications and trade standards. Why not use this wealth of information to prepare good reference specifications? By this I mean present in tabular form


1. General

Include such information peculiar to your job such as:

- Security Requirements
- Clean-up
- Furnished Utilities
- [etc]

2. Materials and Installation

Present a table of materials such as:

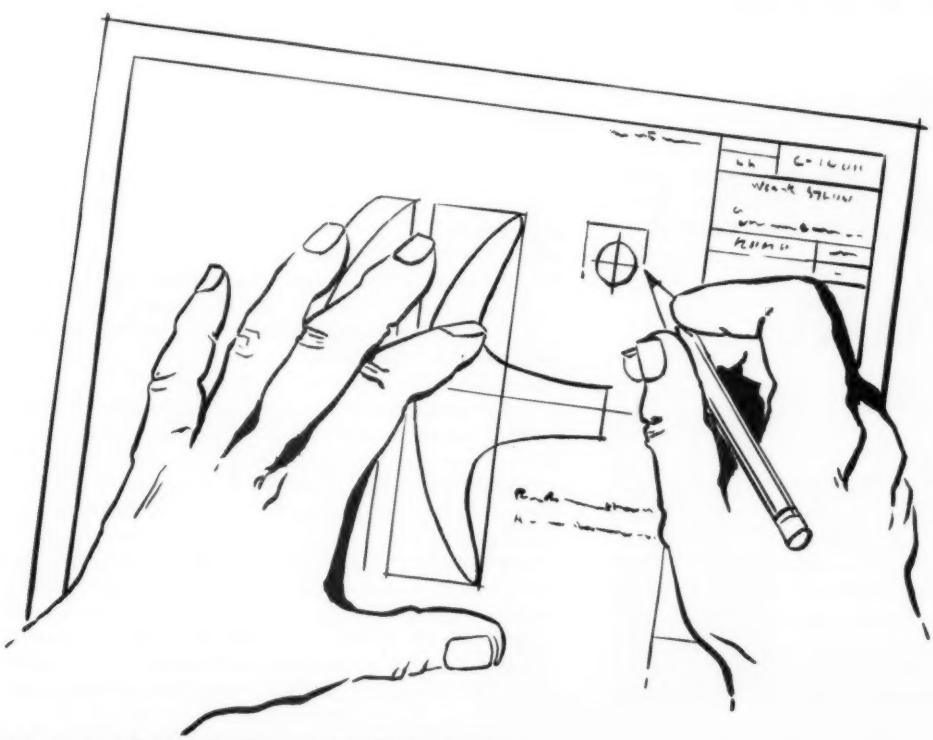
Item	Reference Standard	Grade	Installation/Test	Remarks
Acoustic Tile	SS-S-00118 [date]	Type/ Pattern/ Class/ Grade	Procedure or Standard; For example: Route CE 237.01 or AFM 88-15	Approved Sample Required before Installation

Figure 1: Reference Specifications.

on your drawing two basic divisions in the format shown in **Figure 1.**

The contractors and trade specialists are well aware of industry and government standards, and you have access to them too, so enforcement is possible. Many small jobs could be handled in this quick way by placing reference specifications on the drawings.

You are urged to weigh these methods carefully against your projects. Check with your command counterparts to see if someone else has already invented the wheel you're working on. Select the best technique for your job. Are you really being honest when you say: "There just aren't enough hours in the day to do everything!" or are you "BC" in your design approach? CE



Free Hand Drafting.

An Open Discussion on the Prime BEEF Program

by Capt Max W. Day, PE

One of the most controversial programs in Air Force Civil Engineering during the past decade was initiated in October 1964. The much maligned and praised Prime BEEF (Base Engineer Emergency Force) program originated after careful and detailed planning and is probably the least understood of any management program today. Showing no discrimination, the program has been under fire from both military and civilians alike while quietly achieving high praise from recipients of the program. It has been called:

- Phoney as a three dollar bill.
- A covert attempt to militarize civilian jobs.

Conversely, the program has received outstanding accolades from the Joint Chiefs of Staff Joint Logistics Review Board, the Secretary of the Air Force, the Chief of Staff U. S. Army, Vice Chief of Staff U. S. Air Force, CINCPAC Representative from Guam and TTPI, and the Marianas District Legislature, to name a few.

The purpose of this article is to examine the main adverse comments and to present factual evidence in answering the comments. Space will not permit examination of all comments; however, the items selected should provide a cross-section of past criticism and a critical review of the validity of such criticism.

COMMENT:

Prime BEEF has blocked civilian career progression and militarized jobs historically civilian.

RESPONSE:

Prime BEEF has realigned positions in order to achieve a more equitable balance of supervisors Air Force-wide while streamlining the military force. Upon attainment of the end-position requirements, nearly 3,000 (net) military positions will be converted to civilian. Civilian force ceilings have continually restricted the Air Force from implementing military-to-civilian conversions at a faster rate. The realignment of supervisor positions has resulted in fewer civilian positions in those commands heavily civilian while the opposite is true in those commands which had been primarily military. Also, one of the major goals of the program is to provide equitable career development opportunities for both civilian and military personnel.

COMMENT:

Prime BEEF is a guise to militarize all base functions.

RESPONSE:

The Prime BEEF program applies only to personnel authorized in functional code 44XX positions (Base Civil Engineering work force). It strives to insure a minimum number of military are available to meet the requirements identified in AFR 93-3, such as base recovery, a rotational base, mobility and career progression.

COMMENT:

The Prime BEEF program is in conflict with the base mission; use of Prime BEEF personnel during deployments or training decreases from the productivity of the work force.

RESPONSE:

Prime BEEF teams are designed to support the Air Force mission as are the parent bases to which the teams are attached. Unfortunately, local base objectives are sometimes placed in a higher perspective than the Air Force mission because of daily contact and familiarity with problems on a local level. It is the responsibility of the major air command to insure that local commanders are aware of Prime BEEF requirements and how they tie-in with the overall mission. Prime BEEF may decrease the number of military manhours available for productive in-house effort; however, again relative priorities are the major

factor. Trained, skilled personnel capable of rapid response are an essential part of overall contingency or emergency efforts. The time requirement for training is deemed essential at the expense of fewer available manhours to the base O&M effort.

COMMENT:

The Air Staff Prime BEEF Team has identified more military personnel than is needed to recover essential functions of the base for a 36-hour period.

RESPONSE:

In addition to providing a minimum level recovery force, the Prime BEEF program must insure that an adequate CONUS military base is available to support overseas requirements; also career progression opportunities must be insured for each career field in civil engineering. This often requires more military authorizations than are needed for pure recovery efforts. Since, obviously, the additional personnel cannot be placed on a mobile team, the only other place they can fit is within the recovery teams.

COMMENT:

Prime BEEF does nothing for the individual team member except induce long family separations, additional workloads, and extremely short notice reactions.

RESPONSE:

Prime BEEF has produced clear career visibility to key supervisory positions, effected a fair mix of supervisory positions and gained additional authorizations for the enlisted grades, E-6 through E-9, as indicated:

	1965	*1970*
E-6	2,163	3,118
E-7	913	1,493
E-8	307	586
E-9	70	164

Although assignment to a mobile team may well mean long TDYs requiring short notice response, the program also insures that the member is familiar with and prepared for emergency response. Deleting the program will not cancel the TDY requirements, but only erase established personnel procedures which prepare the individual for deployment.

COMMENT:

How can the Prime BEEF program help my base?

RESPONSE:

Prime BEEF gives you better trained and experienced personnel. All civil engineering career fields (except sheet metal) now have technical courses available to prepare the airman. Also, the nearly 6,000 personnel deployed under Prime BEEF insures that the NCO has the experience necessary to do the job. In addition, the presence of mobile teams ready to respond with a maximum of 28 hours notice insures a sort of "fail safe" operation. The response to Hurricane Camille at Kessler AFB and Combat Fox operations in Korea are prime examples. In other words, Prime BEEF is available to assist any time, anywhere if the need is great enough.

COMMENT:

I encumber a position identified by Prime BEEF for conversion to military, will I lose my job?

RESPONSE:

Not until you vacate the position. The program has built-in protection for the civilian employees which states the position will not be converted until the employees voluntarily attrite or leave for other reasons. There must not be adverse action toward either the military or civilian employee as a result of Prime BEEF. Obviously, however, the program cannot block reduction-in-force actions dictated by higher authorities or budget restrictions.

COMMENT:

If the Prime BEEF program has identified military authorizations to be converted to civilian, why isn't this being accomplished?

RESPONSE:

Twenty-three hundred authorizations have been converted to civilian and 3,500 (net) remain. Civilian force ceilings and budgetary restrictions imposed over which the Directorate of Civil Engineering has no control have limited attaining the goal. Conversions are still being effected as resources become available, but the lack of civilian authorization resources have required balanced actions to complete these conversions. With the lifting of ceiling restrictions and adequate funding, military-to-civilian conversions can proceed at a faster pace.

COMMENT:

How can I find out which positions are designated military and which are civilian?

RESPONSE:

Each base is provided a "posture" which reflects the end-position mix required. As a consequence, the Unit Detail Listing (UDL) is coded according to the "posture" established by the Air Staff Prime BEEF team in conjunction with the parent major command Prime BEEF committee. The Base Civil Engineer and civilian personnel representative should have copies of the "posture" available.

NOTE: Figures cited in the text are based on current authorizations and are subject to change due to force restrictions, base closures or mission changes.

CAPTAIN DAY is a Prime BEEF Staff Officer, Civil Engineering Center, Wright-Patterson AFB, Ohio. A graduate of Oklahoma State University with a bachelor's degree in civil engineering, he earned his master of science degree in engineering from the same university. He is a registered Professional Engineer in Ohio and holds membership in the Society of American Military Engineers, American Society of Civil Engineers and the National Society of Professional Engineers.

well done

Award Goes to Ramey AFB Deputy Fire Chief

SMSgt Francis A. Master, Deputy Fire Chief, 1640th Civil Engineering Squadron, Ramey AFB, Puerto Rico, was named the winner of the "Well Done Award" for 1971, the only award that honors the outstanding contribution to fire protection by an individual. It is sponsored by the Directorate of Civil Engineering, Headquarters U. S. Air Force.

Sergeant Master was cited for his exceptional leadership and courage in directing and actively participating in the extinguishment of a 20,000 barrel JP-4 fuel tank at Ramey AFB on 8 June 1971. According to reports, severe thunderstorms moved over the base and, during the heavy rains, a bolt of lightning struck the tank which immediately burst into flames.

Moments after the alarm, Sergeant Master directed his crew to position their fire trucks on the incline of the tank dike to gain the maximum height and best angle for the truck mounted nozzles. Seeing that the chemical agent was running down the sides of the tank instead of reaching the top, Sergeant Master directed his men to fight the fire with hoses connected to the chemical trucks. Despite the heavy rains, lightning and blazing fire, he and five of his firemen climbed the ladder to the top of the tank to fight the fire. Additional fire fighters were at various heights of the ladder to support the heavy hose while others were at the base of the tank playing out additional hose as it was needed.

It was reported that had the tank exploded at this point, all of the firemen would have been inundated with the flaming fuel. The fire was eventually brought under control and extinguished.

Sergeant Master will receive a plaque at a date to be announced.

Winners of FY 71 Major Command Fire Protection Awards Announced

Winners of the Major Command Fire Protection Awards for Fiscal Year 1971 were announced by General John D. Ryan, Air Force Chief of Staff, during Fire Protection Week in October.

Major commands which achieved the best overall fire protection results included:

First Place: Alaskan Air Command.

Second Place: Tactical Air Command.

Third Place: U. S. Air Forces in Europe.

The awards are based upon the command real property and materiel contents fire loss experience during the fiscal year. Factors considered are dollar loss per capita effective population; number of fires per 10,000 effective population; and dollar loss per million total command evaluation at risk.

General Ryan also announced that "although Fiscal Year 1971 was the lowest fire loss year in Air Force history, we obviously seek to improve on that record."

Plaques will be presented to the commands at a date to be announced.

Fire Box

1st Quarter Fiscal Year 1972—1 July 71 to 30 Sep 1971
USAF Real Property / Materiel Fire Loss

COMMAND	NO. FIRES	USAF $ LOSS
AFAFC	0	0
AFCS*	0	0
AAC	2	3,360
ACIC*	0	0
ADC	7	26,777
AFLC	10	676
AFRES	0	0
AFSC	10	577
AFSC (Ind Fac)*	0	0
ATC	12	15,559
HQ COMD	1	28
MAC	11	129,446
SAC	42	14,013
TAC	9	62,412
USAFA	0	0
USAFSS	2	78
USAFSO	0	0
USAFE	6	10,003
PACAF*	0	0
TOTAL	112	262,925

BDP

How to Accomplish a Base Development Plan

by Capt Robert L. Bell

A milestone in the civil engineer's continuing effort to improve his support of Air Force operations was accomplished during the recent Worldwide U.S. Air Force Civil Engineering Contingency Planners' Conference at Wright-Patterson AFB, Ohio. Maj Gen Guy H. Goddard, former Director of Civil Engineering, had long recognized that the civil engineer must have the capability to rapidly respond to contingency situations. In fact, this capability was one of the 11 Civil Engineering Objectives for FY 1972. Recognizing the extreme importance of the civil engineering contribution to the planning process, General Goddard was instrumental in assuring that representatives from the Joint Staff, six Air Staff agencies, all unified and specified commands, and all the major air commands were in attendance.

During the conference, working groups presented an opportunity for an exchange of planning ideas and concepts among component commands, Joint Staff, Air Staff and major command civil engineering contingency planners. The underlying discussions centered around the requirement for an effective and rapid method of accomplishing a Base Development Plan (BDP).

The preparation of a BDP, required as an appendix to the Logistic Annex of an Operation Plan, is a civil engineering responsibility. The BDP is a detailed document outlining facility requirements, existing assets, deficiencies and construction forces required to overcome the deficiencies in a time frame acceptable to support the contemplated military operation on a given airfield. To properly prepare this document the civil engineer planner must participate in the initial selection of airfields within a chosen theater before an extensive BDP is attempted. During this initial selection process the civil engineer must collect and analyze all existing engineering data that is available through the various intelligence systems, civilian and military library and engineering publications.

Once the engineering intelligence of the chosen theater and the requirements of the proposed weapon system to be employed have been evaluated, the base development process begins. The BDP must reflect careful consideration of the possibility that contingency operations may rapidly expand from an initial limited action of short duration, with all facility requirements satisfied with airlifted prefabricated units, to a sustained posture where facility requirements will be satisfied with relocatable and preengineered structures.

The conference surfaced the fact that the Air Force is the only service that does not currently possess a mechanized base development planning system capable of rapid data update. The present Air Force base development process is a cumbersome, time-consuming, manually accomplished effort that does not lend itself to rapid update or revision.

An important recommendation by the conference panel members was the tasking of the Civil Engineering Center (CEC) to develop an Air Force mechanized base development planning system for utilization by major commands in their preparation of standard BDPs. As the focal point for civil engineering base development planning, the CEC will develop a set of Facility Requirements which will be required to support various Squadron / Wing slice echelons of deployable weapon systems. The mechanized base development planning system will be within the guidelines of the Joint Operations Planning System and will consider gross planning factors on the standard base planning factors; the Manpower and Equipment Force Packaging system; Unit Type Codes; and DoD three digit category codes. The system will interface the information currently available on the RCS Z-17, Real Property Reports; and U.S. Air Force Aeronautical Chart and Information Center produced Automated Air Facilities Intelligence File data; and the mechanized POL capabilities report with the planned facility requirements, to tabulate gross facility deficiencies requirements.

In the development of a BDP, the civil engineer planner must be aware of the civil engineering forces available to support contingency operations and be aware of the facilities and facility substitutes available to fulfill mission essential deficiencies.

cont'd next page

In one of the working panels during the conference, a firm deployment time-phase concept was discussed and agreed upon for the three sources of civil engineering forces available to support various contingency operations. This time phase recommendation has just recently been approved by the Air Staff. The three sources of civil engineering forces are active duty Prime BEEF "C" and "F" teams; active duty Civil Engineer Squadrons (Heavy Repair); and Air National Guard / Air Force Reserve Prime BEEF teams and Civil Engineer Squadrons.

The active duty Prime BEEF teams and CES (HR) will be considered as the initial source of support in contingency plans. The Prime BEEF "F" teams will accompany the flying unit to which they are required to support, and will maintain a readiness response consistent with the flying unit. The Prime BEEF "C" teams will be postured and capable of deploying within 28 hours after notification. Normally, Prime BEEF "C" and "F" teams will be deployed early, perform work not requiring heavy equipment and will be withdrawn after a short period. Since the Civil Engineer Squadrons possess some non-air transportable heavy equipment, the full squadron cannot rival the responsiveness of Prime BEEF.

TAC Deployment Schedule Used

The Tactical Air Command developed deployment schedule for the CES is now utilized as the Air Force system. All Civil Engineering Squadrons' assets, personnel and equipment, are pre-identified as one of the following echelons: CES 1, CES 2, CES 3. The CES 1 echelon is composed of air transportable equipment and site development and planning personnel. This team is capable of deploying in support of a contingency operation within 12 hours of notification. Other air-transportable equipment and approximately 100 personnel from the various civil engineer skills and support skills compose CES 2, which can deploy within 72 hours after notification. The remainder of the squadron equipment and personnel are assigned to CES 3. This echelon must be moved by surface and can be enroute within 10 days of initial notification. The Squadrons will remain as long as required to support the contingency.

Discussion during the conference emphasized Secretary of Defense Laird's recent memorandum regarding the inclusion of Air National Guard / Air Force Reserve manpower as integral components in the total Air Force force to support all M-day contingency plans. The Guard / Reserve units are no longer to be considered as a backup unit to be deployed at a later date. If the situation so warrants, these units are to be mobilized when a contingency is declared and alerted for deployment together with current active units in a short time-frame.

A main objective of the conference was to acquaint the civil engineering planners with the facility assets available to incorporate into the BDP. The currently available assets are Harvest Eagle sets, Bare Base sets, modular relocatable facilities and pre-engineered buildings. Normally, the Harvest Eagle and Bare Base sets would be utilized as a quick reacting capability. If a contingency would transition into a more sustained phase, then anticipated Harvest Eagle and Bare Base sets would normally be replaced with relocatable and pre-engineered facilities. During various presentations and discussions it was agreed that a BDP should address this possibility. To support this concept it is necessary that each BDP identify the total modular and pre-engineered facility requirement. This requirement can then be procured and utilized in the interim as facility substitutes. Then, if a contingency situation occurs, the modular and pre-engineered facilities will exist in the Air Force inventory and can be readily provided at the contingency site.

Manpower Positions Must Be Established

To fulfill this Base Development responsibility, appropriate civil engineering manpower positions dedicated to BDP preparation must be established either on the major command civil engineering or plans staffs. The BDP concept can only be effective if the major command civil engineer planner can devote full time to the planning responsibility.

The importance of contingency planning by the civil engineer cannot be over emphasized. The farsightedness of the civil engineering Director in recognizing the role of the civil engineer in contingency planning has enabled the civil engineer to be recognized by the Air Staff as the focal point for Base Development Planning. The proper development of a beneficial BDP may often determine the initial effectiveness of the deployed weapon system. As a result of the Worldwide Civil Engineering Contingency Planners' Conference, the conferees were able to formulate a uniform philosophy in the development of concepts, criteria and objectives to assure that the direct combat support mission of Air Force Civil Engineering is enhanced through proper contingency planning.

The direct mission support role of civil engineering dictates that a constant communication link be maintained with operations planners to insure that the necessary facilities and systems are available when a plan is implemented. With the current philosophies of Air Force mobility and total force concepts, realistic planning by the civil engineer can insure that the Air Force mission will be supported through action rather than reaction.

CAPTAIN BELL is a Contingency Plans Officer, Operations and Plans Section, Civil Engineering Center, Wright-Patterson AFB, Ohio. A graduate of Ohio University with a bachelor of fine arts in architecture, he is a member of the Society of American Military Engineers.

Six Receive Company Grade Award

Capt Richard Benzinger, Jr

Capt Alan N. Bredenberg

Capt Martin M. Fritsch

Six Air Force Civil Engineering captains were recently presented the Outstanding Company Grade Officers Award for 1971 by the Directorate of Civil Engineering. The annual award recognizes those company grade officers who have demonstrated outstanding performance in the civil engineering field.

Lt Gen George S. Boylan, Jr, Deputy Chief of Staff, Programs and Resources, presented certificates to the officers during the annual World-wide Civil Engineering Conference, held at Homestead AFB, Florida in December. The recipients were:

Capt Richard Benzinger, Jr, 86th Civil Engineering Squadron (CES), Zweibrucken AB, Germany, United States Air Forces in Europe;

Capt Alan N. Bredenberg, Civil Engineering Division, 3500th Air Base Group, Reese AFB, Texas, Air Training Command;

Capt Martin M. Fritsch, 819th CES, Westover AFB, Massachusetts, Strategic Air Command;

Capt Terry L. Moore, III, 6314th CES, Osan AB, Korea, Pacific Air Forces;

Capt Walter E. Smith, Engineering and Construction Directorate, Headquarters Air Force Logistics Command, Wright-Patterson AFB, Ohio; and

Capt Richard N. Vickers, Headquarters Southern Communications Area, Oklahoma City AFS, Oklahoma City, Oklahoma, U. S. Air Force Communications Service.

The winners were selected from a field of 26 nominations submitted to the Directorate of Civil Engineering by major air commands.

The award is designed to promote greater effectiveness among civil engineering company grade officers, to improve professional performance in Air Force Civil Engineering and to give appropriate recognition to outstanding civil engineering officers and identify them early in their career.

Selection for the honor is based upon effectiveness reports, level of previous assignment, level of education breadth of experience in the civil engineering field, manner of performance in current assignment, training and growth potential, degree of responsibilities and other pertinent and appropriate factors.

The award was presented for the first time last year.

Capt Terry L. Moore, III

Capt Walter E. Smith

Capt Richard N. Vickers

AF/PR EMPHASIS

(Information contained in this department of the Journal is provided by the various Divisions that make up the Directorate of Civil Engineering. It is intended to keep personnel at the Base Civil Engineering level informed of actions at Headquarters U. S. Air Force.)

PLANT ENGRG. DIVISION

A new first of its kind high speed aircraft fueling system was put into operation recently at McChord AFB, Washington. It is a fully automatic pressurized system that can fuel aircraft up to a maximum rate of 1,200 gallons per minute. The system is designed to automatically furnish fuel on demand to any type aircraft at the exact rate the aircraft will accept it. With this new design, a new type of self-propelled hydrant hose truck is required. These trucks have a maximum fueling capacity of 300 gallons per minute. The new hydrant hose truck and new fueling system at McChord AFB performed exactly as anticipated. All performance requirements were met or exceeded. This is a significant step forward in improved aircraft fueling methods. The new systems will be capable of much higher fueling rates, will be simpler and safer to operate and maintain, and will be much less costly to construct. The new design concept was developed by AF/PREE and will be used for all future hydrant fueling systems in the Air Force.

ENVIRONMENTAL PROT.

A new **AFR 19-1** (replaces **AFR 161-22**) is forecast for publication in 1972. A major change is that it further directs the formation of Environmental Protection Committees at base level. An active, informed environmental protection committee is especially important because the new **AFR 19-2** (also forecast for 1972 publication) tasks the committees with evaluation of environmental assessments and environmental statements.

* * *

The Civil Engineering School, Wright-Patterson AFB, Ohio, has trained 160 Air Force personnel in its Environmental Protection Course in the last 18 months. These people are readily accessible in all major Air Force organizations and they will be of great help to organizations involved in preparing written assessments and environmental statements. Identify and use this trained talent.

REAL PROPERTY MGMT.

A new regulation in the 87 series, entitled "Real Property Responsible Officers," has been approved by the Air Staff and is scheduled for publication early this year. It provides policy, responsibilities and procedures for custody, care and protection of real property facilities including RPIE. The regulation also introduces a new AF Form, entitled "Real Property Maintenance Request," which has been designed to provide direct access to Base Civil Engineering by the Real Property Responsible Officer for all routine maintenance and repair requirements on assigned facilities.

MANAGEMENT DIVISION

Visits to bases continue to identify equipment items included in the Equipment Maintenance Program that should not be there. For example, steam traps, small exhaust fans, valves, strainers, meters, small motors, etc., may require recurring maintenance, but ask yourself these questions: Is the item a part of a system that would require only a single entry in the EMP? Does the item cost less than $75? Does the item have moving parts that require recurring maintenance? AF/PREMA letter, 13 May 1971, provides additional guidance and the new concept for the EMP. Read it, follow it and it will save many manhours that may now be wasted maintaining needless records and performing unnecessary inspections when maintenance is not required.

* * *

Planning technician training is now available through an ATC Mobile Training Team. The course covers Total Programming (work identification) and Engineered Performance Standards (use and application). It is a 40 hour, 5 day course, and 450 spaces have been programmed for FY 72 training. Commands should submit requirements to ATC.

CE CENTER

Each BCE is responsible for developing a useable base recovery plan in accordance with **AFM 93-3.** Initial review of some plans reveals they are vague and not adaptable to each base. Information is not specific enough in relating recovery responsibilities to individual team members. Peculiarities of a base must be addressed when considering utilization of resources, personnel, equipment, etc. Each different concept should be incorporated into the single document recovery plan.

* * *

Recent staff visits have revealed misinterpretations of instructions for the FY 72 Management Review Program Table 3A, General Purpose Vehicle Utilization Rate. A clarifying revision to these instructions has been forwarded to

AF / PREMB for consolidation with other revisions. These revisions should be published to all commands for implementation in the near future.

* * *

A change to **AFM 93-5** incorporates instructions to AFRCEs and MAJCOM civil engineers regarding use of construction control data for performing initial pavement evaluations on new or rehabilitated airfield pavements. Since the Civil Engineering Center has its own pavements evaluation capability, the construction agent's partial evaluation from control data is a needless expense. The change eliminates the requirement for initial evaluation of new or rehabilitated airfield pavements by the construction agent and instructs the AFRCEs and MAJCOM civil engineers to obtain control data for subsequent inclusion in Air Force pavement evaluation projects.

HOUSING DIVISION

The inspection of furnaces in family housing should be included in the Equipment Maintenance Program as delineated in AFR 85-1. One means of accomplishing a portion of this task is to include it in the items checked during the period between occupancy. The inspection should include all necessary adjustments, cleaning and leak checks.

Recent projects involving roof repairs indicate that preventive maintenance and thorough MFH facility inspections could have lessened the scope and cost of the projects. In several instances, however, structural damage had occurred which was not visible until the structural components were exposed. Roofing overlays on existing roofing materials should be made only after assuring that the structural members are sound. In conjunction with roof maintenance and repair, the inspection of work as it is accomplished is extremely important. A perfunctory inspection of the completed job gives no indication of what has been provided.

ce worth noting

University of Wisconsin Gives Credit for CES Engineering Courses

Within context of the Professional Development Degree Program, (see November 1971 AIR FORCE CIVIL ENGINEER, "The Professional Development Degree Program"), the University of Wisconsin will give credit for Civil Engineering School courses as follows:

Executive Engineering Course	100 hours
Base Civil Engineer Course	80 hours
Management Applications Course	80 hours
BCE Staff Officers Course	80 hours
Environmental Protection Course	50 hours
All other technical courses	50 hours / wk

Presidential Directive Will Impact Civil Engineering Position Description

The recent Presidential directive to reduce the average General Schedule grade will have impact upon the Standard Base Civil Engineering Position Description Program. It will be difficult for Civil Engineering to justify position implementation which involves upgrading personnel. Implementation at grade level, however, is not affected.

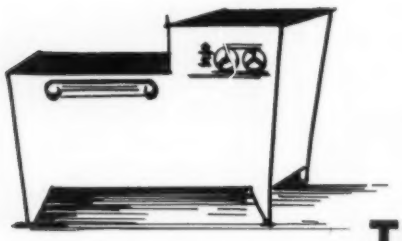
Base Civil Engineers should make strenuous efforts to implement these positions. Advice will shortly be provided to Civil Engineering organizations from the Civil Engineering Center as to the efficacy of using training programs to implement the Presidential directive and simultaneously protect current authorizations.

Civil Engineering Center Will Move to Tyndall AFB in Summer of 1972

The Civil Engineering Center, Wright-Patterson AFB, Ohio, will move to Tyndall AFB, Florida, during the summer of 1972 to provide for expanded operations.

The Center was originally founded as the Civil Engineering Construction Operations Group at Wright-Patterson AFB in 1966, and assumed its present name in 1969. It is a division of the Directorate of Civil Engineering, Headquarters U. S. Air Force.

Its mission when first established was to train engineering units for worldwide support of combat units. Since that time, its mission has been expanded to provide specialized engineering, technical and planning assistance to compliment the integral capabilities of the major air command and base level civil engineering organizations, and to insure that civil engineering forces provide a capability to respond to emergencies and contingencies.



BEAMS, The Multi-Purpose Tool

by Capt Herbert L. Hollar, EIT

The Base Engineer Automated Management System (BEAMS) has become an established part of Base Civil Engineering. However, universal acceptance of this new system is still some time away. Unless people work directly with the various subsystems, review and analyze the products, and find ways to apply BEAMS to their everyday world, they find it difficult to think of it other than another troublesome, sometimes infuriating system forced on the bases by "the people up the line." This feeling will erode in time as the benefits become more visible to those whose jobs do not require them to "live" with the computer. This article is presented both to the BEAMS "operators" and to those whose contact with the system is less frequent. First, it will cover a few ways that BEAMS provides information of value to everyone in civil engineering; and lastly, it will offer some suggestions on BEAMS applications not previously published in manuals.

Lists Every Work Order

The BCE Work Order Backlog Report (PCN: N200360) lists every work order requiring in-service effort. It shows the facility number, if applicable, work classification, priority, and the like. One of the main benefits of this report is the material status display by individual work order. Line items due in are identified in the familiar 0-30, 31-60, 61-90, 91+ format. Without referring to the material status charts, anyone can see the supply picture in one convenient package. Very quickly the reader can determine the percentage of work orders awaiting material 91+ days. Work orders with materials complete and awaiting scheduling, work orders that are exceeding their estimated manhours, and multi-shop work orders that are complete save one work center are clearly identified on this product. At the end of the report is a summary showing the manhours committed, by work center, for the work orders in the civil engineering system.

The BCE Material Transaction List (PCN: N200466) is designed primarily for Material Control to monitor the day-to-day flow of material line items. However, there is one portion of this report of interest to others in civil engineering. Daily, this report lists the creditable and non-creditable turn-ins charged to civil engineering. Non-creditable turn-ins are a problem, for they represent material money charged to the BCE for which no use was made. If this particular portion of the "466" is supplied to the BCE and the Chief, Programs Branch, senior civil engineering management can monitor and take action to control this supply dollar loss.

Under the former labor reporting system, a person's labor could be charged against any work center. Shops falling behind would borrow from shops having surplus manhours or whose work had less priority. Under BEAMS this is still possible and allowable with one difference. Formerly, there was no easy method to see which work centers were constantly loaning and those that were borrowing. With BEAMS a man's time must be charged only to his work center. If he is loaned, his time is still charged to his work center but on a loaned status. The gaining shop is recorded on his time sheet. With this information, the computer produces the Monthly Labor Augmentation Report (PCN: N200253). Each shop is listed showing hours it borrowed from and loaned to specific work centers. This report is an excellent starting point for manpower evaluations in the civil engineering organization. Work centers "in trouble" due to a lack of available manhours are easily identified; work centers with excess people are clearly marked. Shuffling manning positions accordingly would insure a fairer manning distribution consistent with the workload.

Principle is Keystone

The management by exception principle is a keystone of the BEAMS system. Generally we only want information on present or potential problems. "Leave well enough alone," so to speak. The BCE Cost Limitation Comparison Listing (PCN: N200366) is a good example of how BEAMS employs the management by exception technique. Minor construction work orders are identified as they pass the 85 percent completion mark, comparing the actual with the estimated cost. All in-service work orders are flagged when they exceed 100 percent of the estimate. Perhaps there is a planning problem, or a work center problem, or a problem in a Recurring Work List. Whatever, this report is a good starting point for quality control evaluation. The previous automated system listed all work orders as they progressed toward completion; it did not separately identify those with a

"problem." BEAMS does this daily, and continues to display the work order until it is completed or revised via the change order.

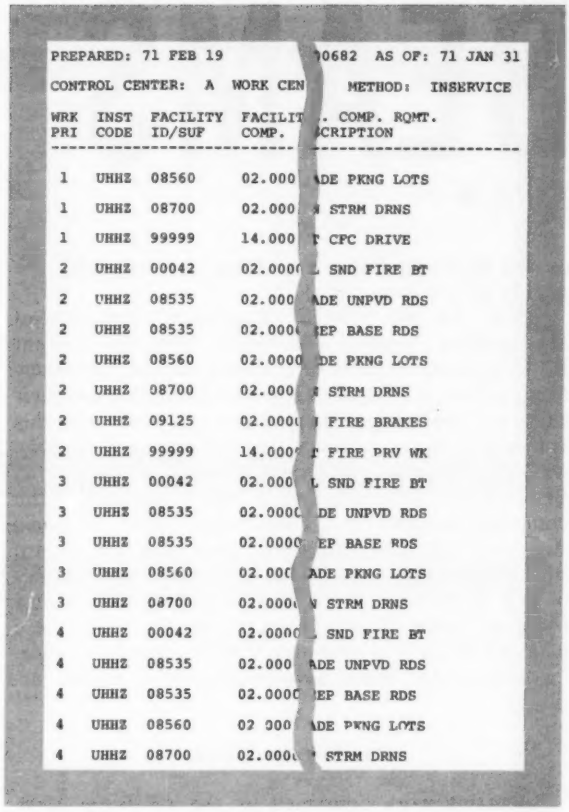
A chief problem in civil engineering is the In-Service Work Plan, its development and compliance. The BEAMS system offers a limited view of compliance with the Monthly In-Service Work Plan Report (PCN: N200252). Rather than view compliance with a work orders scheduled vs work orders completed within a given time frame, this report compares estimated vs actual manhours expended by labor utilization code (LUC). The idea apparently is if the IWP Programmer figures his LUC percentages correctly, chances are he has scheduled his work orders properly. The variances reported by cost center describe the worth of the In-Service Work Plan. The Weekly Schedule Report (PCN: N200251) monitors the Scheduler's Plan (AF Form 561) in the same fashion, estimated vs actual manhours by LUC by work center. Since the Weekly Schedule should "fine tune" the IWP, a comparison of the "251" and the "252" tells management if this attempt is successful. If estimated LUC percentages substantially disagree, either Scheduling isn't using the IWP, or the IWP is inaccurate. The actual manhours reported are the same for both reports. Therefore, management can now determine whose report is closest to the actual expenditure for labor resources. A thorough study and comparison of these two BEAMS products can lead to some very interesting analysis and subsequent conclusions.

Annual Facility Survey Becomes Important

As the Total Programming concept becomes more established at the base level, the annual facility survey becomes increasingly important. Under theoretical conditions, all maintenance and repair work requirements should be generated by this facility inspection. With the advent of the visible IWP, production control and COCESS (Contractor Operated Civil Engineering Supply Store) civil engineering work forces are becoming more productive. Some bases have had the unusual experience of almost running out of work for their in-service forces. Suffice to say the work is there, but it must be identified in time for proper programming.

The BEAMS Automated Total Programming Subsystem offers two methods of determining both the facility survey progress and the quality of the survey itself. The Survey Schedule Report (PCN: N200661) lists the facilities to be surveyed in the following months. It also lists those facilities previously scheduled but yet to be inspected. These delinquent facilities are listed by their original survey month and remain on subsequent schedule print-outs until they are inspected. The quality of the facility survey can be determined from the resource requirement collations. It is a simple task to determine the BCE's yearly capability for maintenance and repair work; this is located in the IWP. If six months of the facility survey yields only a total manhour figure of one fourth the

cont'd next page

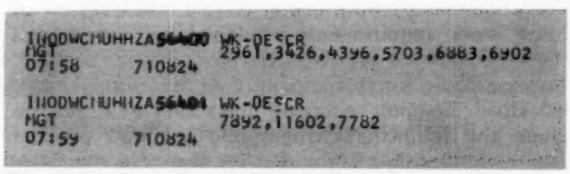


PREPARED: 71 FEB 19 ...0682 AS OF: 71 JAN 31

CONTROL CENTER: A WORK CEN... METHOD: INSERVICE

WRK PRI	INST CODE	FACILITY ID/SUF	FACILIT... COMP.	...COMP. RQMT. ...CRIPTION
1	UHHZ	08560	02.000	...ADE PKNG LOTS
1	UHHZ	08700	02.000	...STRM DRNS
1	UHHZ	99999	14.000	...CPC DRIVE
2	UHHZ	00042	02.000	...SND FIRE BT
2	UHHZ	08535	02.000	...ADE UNPVD RDS
2	UHHZ	08535	02.000	...EP BASE RDS
2	UHHZ	08560	02.000	...DE PKNG LOTS
2	UHHZ	08700	02.000	...STRM DRNS
2	UHHZ	09125	02.000	...FIRE BRAKES
2	UHHZ	99999	14.000	...FIRE PRV WK
3	UHHZ	00042	02.000	...SND FIRE BT
3	UHHZ	08535	02.000	...DE UNPVD RDS
3	UHHZ	08535	02.000	...EP BASE RDS
3	UHHZ	08560	02.000	...ADE PKNG LOTS
3	UHHZ	08700	02.000	...STRM DRNS
4	UHHZ	00042	02.000	...SND FIRE BT
4	UHHZ	08535	02.000	...ADE UNPVD RDS
4	UHHZ	08535	02.000	...EP BASE RDS
4	UHHZ	08560	02.000	...ADE PKNG LOTS
4	UHHZ	08700	02.000	...STRM DRNS

Figure 1. Grouping all recurring work by quarter.



IHODWCIUHHZA56400 WK-DESCR
NGT 2961,3426,4396,5703,6883,6902
07:58 710824

IHODWCIUHHZA56401 WK-DESCR
NGT 7892,11602,7782
07:59 710824

Figure 2. A typical inquiry into a file.

CAPTAIN HOLLAR is a Maintenance Engineer, Civil Engineering Division, Headquarters 2853rd Air Base Group, Robins AFB, Georgia. He is a graduate of Clemson University, where he earned a bachelor's degree in civil engineering.

BEAMS

cont'd

overall BCE capability, something is wrong with the quality of the inspection.

AFM 85-200, Base Engineer Automated Management System (BEAMS), lists all current BEAMS products and a short explanation of their uses. Much information and ideas are available through their study and application. However, as one works with this system it becomes apparent that still more can be done with this computer than is described in AFM 85-200. BEAMS is an inflexible system only in the area of the computer program, i.e., bases cannot alter the basic structure of BEAMS. However, data used in standard BEAMS files is not inflexible. The following examples of new applications are presented to demonstrate how bases can more effectively use this system. All of these ideas are actually in operation at Robins AFB, Georgia. Probably other bases have implemented similar actions.

Total Picture Given

Recurring work contained on the AF Form 1708, Recurring Work List, is a big percentage of the in-service effort. Inclusion into the Total Programming Subsystem gives a more total picture of civil engineering support to the individual base facilities. The collations by work center offer a quick review of other work requirements produced by the annual survey and, when the recurring work list is included, shows a more complete picture of the shop annual workload. Loading recurring items isn't new, but include the following changes and the end product creates a clearer picture. Rather than use the work priority field for its intended use, make it the quarter indicator, i.e., the first quarter is entered as "priority 1", the second quarter "priority 2", etc. The computer will then group all recurring work by quarter, much the same way as displayed in **Figure 1.** Recurring work items for Equipment Operations are grouped by quarter of accomplishment; the program quantity shows the total shop commitment per item per quarter. Within the quarter the specific months of accomplishment are displayed in the contract cost field. (Since the input was coded "In-Service," the "contract cost" field is not totaled and will not interfere with other colations.) Knowing what the work priority and contract cost figures now mean, each item can be related to the In-Service Work Plan. For instance, Equipment Operations will spend 168 hours in October supporting Fire Prevention Week. From **Figure 1** it is obvious that this work center spends 957 hours per quarter sweeping base roads, and the work is spread over all months of the quarters. Fire breaks are cleaned in November.

Some bases may find it convenient to have a real time work order by facility file within the B3500 computer. Often work order status is sought by an individual who knows only the facility number; he doesn't know the work order number. An inquiry into the computer would produce all work order numbers assigned to that facility. Referring to the work order log or the BEAMS Work Order Backlog Report, the status becomes available. A typical inquiry into such a file is displayed in **Figure 2.** This file is created by loading a dummy collection work order minus the shop files to prevent accidental cost accumulation. The work order numbers are inserted into the work description field. The facility number is placed in the work order field. Bases must establish a coding system to prevent duplicating an actual work order number. In **Figure 2,** the facility is 00640. The "5" prevents duplicating "6000" type work order numbers. The last digit of this bogus work order is a sequencive digit to allow storage of more work order numbers. This procedure is also shown in **Figure 2.**

Some Duplication Noted

In some respects, this work order by facility file does duplicate the facility files. However, if the files are not current, start complete file maintenance now. Create the work order by facility file to tide you over until the facility files are up to date. Once established, add no new numbers to the automated file; instead keep the facility files current through the normal file maintenance procedures. Delete numbers from the automated file as the older work orders are completed. When a point is reached that the facility files are current, delete the automated files completely and "live" from the jackets.

The introduction of Automated Total Programming relieved civil engineering of a big, monotonous, clerical workload of collating, cross collating and file update. All that is necessary now is to input the various resource requirements into the computer and let the machine do the collating and file updates. AFM 85-200 describes the remaining procedure of program tracking. Since this subsystem is a "stand alone" system, it is more flexible and lends itself to individual innovations. The following example describes how the program tracking procedure can be taken a step or two past AFM 85-200. Other features are possible; it only requires a little study of the manual and familiarization with the Total Programming System products.

Under present procedures, items are input to the Total Programming Subsystem and tabulated as shown for interior painting of facility 00017, **Figure 3.** This item will be reproduced in subsequent monthly collations until it is deleted. Since there is no established method of identifying disposition of this item, notes must be made in the margin and transferred from collation to collation until the work is accomplished. This is a tedious process and a time

cont'd on page 29

Figure 3. Items input to Total Programming Subsystem and tabulation.

PREPARED: 71 FEB 19 CONTROL CENTER/WORK CENTER WORK & RESOURCE REQUIREMENTS BY FY (PCN: N200682) AS OF: 71 JAN 31

CONTROL CENTER: A WORK CENTER: 452 PROGRAM FY: 72 METHOD: INSERVICE

WRK PRI	INST CODE	FACILITY ID/SUF	FACILITY COMP.	PRGM. QNTY.	U/M	W D	MAN HOURS	CUMULATIVE MANHOURS	SHOP RATE COST	MATERIAL COST	CONTRACT COST	FAC. COM. RQMT. DESCRIPTION
4	UHHZ	99999	14,0000	00250	HR	S	250	7,372	1,000		2	SFT MACON CLEANUP
4	UHHZ	99999	14,0000	00240	HR	S	240	7,612	960		123	PNT DMPSTR CANS
*	RECURRING							7,612	32,156			
1	UHHZ	00591	03.0230	00001	EA	S	16	16	134	10		PNT EXT WOOD
2	UHHZ	00866	03.1111	00001	EA	M	6	22	50	7		PA NEW DOORS
3	UHHZ	00017	03.0710	00592	SF	S	5	27	6	5	11	PNT INT CONC
3	UHHZ	00019	03.0430	01418	SF	S	14	41	56	23	79	PAINT EXT WOOD
3	UHHZ	00019	03.0710	00122	SF	S	1	42	4	2	6	PAINT INT WOOD

Figure 4. Sequential log of work orders produced by facility survey.

PREPARED: 71 JUN 08 FACILITY COMPONENT WORK & RESOURCE REQUIREMENTS BY FY (PCN: N200684) AS OF: 71 JUN 30

PRIMARY GROUP: 51 SECONDARY ITEM NUMBER: 20 PROGRAM FY: 72 METHOD: INSERVICE

WRK PRI	INST CODE	FACILITY ID/SUF	FACILITY COMP	PRGM. QNTY	U/M	C C	WRK CTR	W D	MAN HOUR	CUMULAT. MANHOURS	SHOP RATE COST	MATERIAL COST	CONTRACT COST	FAC. COMP. RQMT. DESCRIPTION
1	UHHZ	99999	51.2013	00634	SF	A	452	S	16	1,316	132	10	547	PAINT INT
1	UHHZ	99999	51.2013	02200	SF	A	452	S	22	1,338	88	44	792	PAINT EXT ASB
1	UHHZ	99999	51,2014	01460	SF	A	452	S	15	1,353	60	30	69	PNT INT CONC
1	UHHZ	99999	51.2014	06911	SF	A	452	S	69	1,422	276	138	794	PAINT EXT CONC
1	UHHZ	99999	51.2014	00002	EA	A	452	S	40	1,462	334	25	25	PNT ATL STRWAY
1	UHHZ	99999	51.2014	01020	SF	A	452	S	10	1,472	40	20	69	PNT EXT CONC
1	UHHZ	99999	51.2014	00592	SF	A	452	S	5	1,477	6	5	17	PNT INT CONC
1	UHHZ	99999	51.2015	00360	SF	A	452	S	3	1,480	12	1	901	PAINT INT MTL
1	UHHZ	99999	51.2015	04584	SF	A	452	S	46	1,526	184	13	901	PAINT INT SHRK

Figure 5. Work Orders in Control Center / Work Center Work and Resource Requirements Report.

PREPARED: 71 JUN 08 CONTROL CENTER/WORK CENTER WORK & RESOURCE REQUIREMENTS BY FY: (PCN: N200682) AS OF: 71 JUN 30

CONTROL CENTER: A WORK CENTER: 452 PROGRAM FY: 72 METHOD: INSERVICE

WRK PRI	INST CODE	FACILITY ID/SUF	FACILITY COMP.	PRGM. QNTY.	U/M	W D	MAN HOURS	CUMULATIVE MANHOURS	SHOP RATE COST	MATERIAL COST	CONTRACT COST	FAC. COMP. RQMT. DESCRIPTION
1	UHHZ	99999	51.2011	03630	SF	S	36	836	144	72	607	PNT EXT METAL
1	UHHZ	99999	51.2012	17193	SF	S	200	1,036	1,600	250	827	PNT INT METAL
1	UHHZ	99999	51.2013	00634	SF	S	16	1,052	132	10	547	PAINT INT
1	UHHZ	99999	51.2013	02200	SF	S	22	1,082	88	44	792	PAINT EXT ASB
1	UHHZ	99999	51.2014	06911	SF	S	69	1,151	276	138	794	PAINT EXT CONC
1	UHHZ	99999	51.2014	01460	SF	S	15	1,166	60	30	69	PNT INT CONC
1	UHHZ	99999	51.2014	00002	EA	S	40	1,206	334	25	798	PNT ATL STRWAY
1	UHHZ	99999	51.2014	01020	SF	S	10	1,216	40	20	69	PNT EXT CONC
1	UHHZ	99999	51.2014	00592	SF	S	5	1,221	6	5	17	PNT INT CONC
1	UHHZ	99999	51.2015	04747	SF	S	47	1,268	188	13	901	PAINT INT CONC

Forecasting and Accomplishing...

Renovation Requirements

by Capt William L. O'Dell, Jr.

A major factor affecting the morale of military personnel is the availability of adequate housing. When not available nor in a satisfactory state of repair, housing can result in a negative motivator for incoming personnel. Some behavorial scientists call this a "hygiene factor;" if one's housing needs are not satisfied, this factor becomes a negative motivator, but totally adequate housing still does not become a positive motivator.

These facts make it obvious that bases must renovate military family housing (MFH) units in between occupancy, in order to provide adequate and satisfactorily maintained housing. A clean and properly maintained house is one of the first impressions a new resident has of a base, and it behooves us to make all such transitions as smooth as possible and to remove all legitimate irritants. This means that we have to accomplish two distinct tasks:

- Predict the moves in advance and plan our work accordingly.
- Identify the exact requirements during our inspections, plan the work and insure timely accomplishment.

The first step, therefore, is to predict housing turnover in advance. Most Air Force personnel know that a relatively high percentage of permanent change of station (PCS) moves occur during the summer months. Ask the right people in the housing office or civil engineering personnel associated with housing maintenance, and you probably will get a more "concisely vague" answer pertaining to the monthly totals for the high summer months or the maximum number of daily terminations encountered.

How many reliable answers would one get, however, to questions like these? What is the three-year average for housing turnover at your base and what is projected for the next year? What percentage of time in days must your full-time housing inspectors be augmented by one man? Two men? Three or more? How many painters should be anticipated for loan to work center 432 during the week of 15 July to perform renovation work?

If you have trouble providing accurate answers, someone in the family housing business at your base might not be exploiting a valuable but simple tool of analysis. Basically, a historical tabulation can be made from existing records that tells exactly how many terminations were made on each day of the last year or any previous year for which records are available. **Table 1** is an excerpt from a tabulation made of Offutt AFB's terminations in 1970.

During the week of 15 July, the range for terminations per day was 0 to 12, and the number of inspections performed ranged from 9 to 26. This impresses one with the fact that terminations, required inspections, and resulting renovation maintenance workloads can vary greatly day to day, even during the same week and month.

The daily tabulation is necessary, for instance, when we are predicting a workload that must be accomplished on a specific day and at a specific time. The first step is to survey the past year's records and

Table 1: Terminations at Offutt AFB, 15-19 July 1970.

JULY	Termination	Pre-Termination	Acceptance	Inspections	Number of Inspectors Required
Mon 15	12	10	4	26	4
Tue 16	0	9	8	9	2
Wed 17	7	8	5	20	3
Thur 18	3	0	2	14	2
Fri 19	5	0	2	16	3

tabulate the number of terminations each day, week, month, and quarter. This should then be compared to the total of the two previous years. If the past year's total for moves was inordinately high or low in comparison to the two previous years, a ratio or factor can be derived, and the daily, weekly and monthly totals above can be multiplied by this factor to more accurately predict the next year's rate per time element. A summary of terminations at Offutt AFB in **Table 2** highlights seasonal trends.

One specific application of this type tally would be to determine the number of augmentees for MFH inspections at various times during the year. We must begin with our daily tabulations and then segregate the peak periods by week or month, depending on the individual base's size and resources and how the augmentation is to be handled. For instance, Offutt AFB has two fulltime MFH inspector-planners and during the high months of May, June, July and August, the augmentation varies from one to two, based on 1½ hours for pretermination inspections, and ¾ hours for acceptance and final inspections (including paperwork and travel). The distribution by various categories of required inspection manhours per day is depicted in **Table 3.**

It is assumed that the overloads in the last three categories in **Table 3,** which amount to 3.1 percent, will not necessitate additional inspectors (above the four shown in the table) since some pretermination paperwork from the peak days can be deferred to the next day if it has ample slack time. A certain amount of leveling can also be attained by properly scheduling and rescheduling the pretermination inspections. It is also assumed that the unit time will not be cut during the peak inspection periods as thorough inspections are considered prerequisite to the timely and thorough accomplishment of work during renovation.

Have doubts about the validity of the routine? Obviously, it was not expected that Wednesday, July 17, of this year would have exactly seven terminations and 20 total inspections; nor was it expected that the same week would have 27 terminations. It could be predicted, however, that the weekly and particularly the monthly totals would approximate last year's, barring mission changes, etc., and that the distribution of inspections would show approximately the same highs and lows, that is, if the month of July had one day of 17 terminations, three of 14, five of 12, etc., then

Jan-69	Apr- 56	Jul-158	Oct-55
Feb-47	May- 95	Aug-120	Nov-54
Mar-48	Jun-201	Sep- 57	Dec-77
184	352	343	186

Table 2: Calendar Year Terminations at Offutt AFB.

something could be expected like one day of 20, three of 15, two of 11, etc.

Still skeptical about forecasting turnover? Obviously SAC operates on two assumptions:

- The relative frequency distributions (in percent) of turnover per period of time, such as month or quarter, is generally consistent across the Air Force. Generally speaking, for each vacancy created at one base, another base is losing the replacement. Many of these moves (47 percent for Offutt AFB last year) occur during the three summer months between school years. The number of houses and moves per unit per year is irrelevant, as the interest is only in predicting the number of moves at a base for a specific time frame.
- Bases have fairly consistent turnover year to year, barring any change in mission or housing inventory. The latter assumption is substantiated by the command three-year history of turnover by base.

Considering the fact that mission changes contribute to some of the highs, and that changes in the housing inventory account for a few, an approximate level of turnover can be predicted for each base. A reduction factor of 10-12 percent might be incorporated due to the current limitation of PCS money for travel and the overall effort to curb moves and stabilize tours.

The prime application of such data in the BCE organization, however, is to forecast and plan for maintenance and repair (M&R) work to be accomplished primarily during the renovation of vacant MFH quarters. The fact that all labor expended in work center 432 (after 1 July) will be loaned from other civil engineering shops makes accurate forecasting of M&R requirements and manpower even more important. It's human nature for shop foremen and superintendents to be reluctant about loaning too many personnel to MFH (especially during peak summer months) unless directed to do so. Therefore, it behooves the housing

cont'd next page

Table 3: Manhours of Inspections Versus Inspectors Required.

Manhours of Inspection Required per Day	0-3.5	3.75-7	7.25-10.5	10.75-14	14.25-17.5	17.75-21	21.25-24.5	24.75-28	28.25-31.5	31.75-35	35.25-38.5
% Occurrence of Annual Total	14.6	25.0	19.6	14.2	12.3	4.2	4.8	2.3	1.5	1.2	0.4
Number of Inspectors Required	1		2		3		4				

cont'd

manager (if under single point management concept) and BCE to insist on the development of some quantitative tools to aid in the decision process, rather than applying "whoever screams the loudest" techniques for applying direct manpower. Predicting MFH turnover in advance is the first step toward instituting a sound program.

Before summarizing the remaining steps, however, let's again list the basic assumptions to insure that everyone is thinking along the same lines.

• The accomplishment of a maximum amount of work during renovation is desirable, since the efficiency of such an operation is inherently greater than that of a service call or individual job type operation. The indirect time spent by $4 an hour mechanics traveling, ringing doorbells of people who aren't home, returning to vehicles or the shop for unanticipated tools or materials, etc., is much greater than if several tasks are preplanned and accomplished at the same time. A service call type operation in MFH can easily expend authorized manhours and still require major contract support.

• The minimum level of occupancy standards must be maintained. **AFR 85-19,** SAC Sup 1, states that either a 99 percent occupancy rate, or five-day down time per move (two for assignment, three for maintenance) must be maintained, whichever results in the highest overall occupancy rate. In almost all cases the days down time per move criteria is applicable, and is always a more valid indicator than percent occupancy, which does not consider the turnover rate.

With these two factors in mind, we can logically lay the groundwork for using forecasted and actual anticipated (from pretermination) housing renovation workloads.

The first step is to initiate a thorough program for identification of work during the pretermination and final inspections, which compose the foundation for any successful renovation program. Then, reliable manhour estimates must be effected from the recently adopted Navy Standards, locally developed standards, or valid historical data. We are really talking about two types of standards here. One is a universal type, such as "paint kitchen of any Capehart unit" on a particular base, including fixture removal and replacement, spackling, etc. The other standard is individually developed from the Navy Standards for a specific task, such as "replace 10 linear feet of quarter molding along baseboard on northeast side of master bedroom, quarters #XYZ.

The next step is to apply the expected weekly and monthly termination figures to the inservice work plan (IWP), using time standards and frequency figures from historical data; that is, we want to be able to estimate for the IWP (a year in advance) the "blocked" hours by skill for the work center 432 renovation work. To do this, we must know the anticipated weekly and monthly terminations, the estimated average number of manhours by skill required for each one, and the number of craftsmen needed to perform this amount of work within the three-day (average) period allowed for down time due to maintenance. The latter two can be developed only through experience and the application of all available quantitative tools and data. Since it is a little unrealistic to schedule different personnel to be loaned to housing maintenance daily, it is recommended that it be accomplished on a weekly and monthly basis; for example, don't schedule three, five, four, eight and six painters on successive days of the week. Instead, assign five for an entire week and then make adjustments if necessary.

After the annual renovation requirements, come the actual anticipated requirements from the pretermination inspections and the adjusting of the forecasted (IWP) figures. **AFR 91-1,** SAC Sup 1, states that housing assignments must receive from O&M a notice of when a housing unit will be returned from maintenance. This must be accomplished within 72 hours from the time the pretermination paperwork is turned in. This will enable housing to tell the new occupant that he can sign for the house at a particular time. Since the outgoing occupant must notify the housing office of his PCS orders approximately 30-45 days prior to departure, the actual estimated manhour requirements (except those missed at pretermination due to rugs, pictures, etc.) by skill can be tallied in plenty of time for incorporation into a weekly schedule, and can thereby specify the level of augmentation for work.

Obviously, the prime ingredients for optimum accomplishment of MFH renovation work vary in degrees of difficulty. The tabulation of moves by various time frames, although requiring only a concentrated application of simple 1 + 1 arithmetic, is frequently overlooked by bases that continue to operate on "ole Joe's WAGs." Estimation of manpower requirements, however, is a much more complicated task, and involves almost everyone in the BCE organization. By continually adding to and revising our historical data and tools of analysis, however, we should be able to take more guesswork out of MFH renovation work. Let's take the initiative ourselves and do this *now*. It is up to us to insure that housing does not become a "negative motivator" for service personnel.

CAPTAIN O'DELL is currently an AFIT student attending San Diego State College, pursuing a master's degree in business administration. This article was written when he served as the Chief, Family Housing Programs Division, Headquarters Strategic Air Command, Offutt AFB, Nebraska. He has a bachelor's degree in industrial engineering from the University of Tennessee and is a member of the Society of American Military Engineers.

BEAMS

cont'd

consuming one, especially when the collations get larger. Since the input is not automatically identified with a work order number, it is not easy to insure deletion when the work is completed. Instead of researching the Delete / Transaction file based on the work order number, the programmer must find the card by the facility number and insure it matches the work described on the work order. However, by a slight change of procedure this problem can be eliminated. When the programmer determines method of accomplishment for the item, the original item is deleted and reestablished as shown on **Figure 4** and **Figure 5.** In this example all in-service work orders generated through the annual facility survey will be included in the 12000 series of work order numbers.

Facility 00017 was included with four other buildings on Work Order 12014 for interior painting. **Figure 4** is an extract from the Facility Component Work and Resource Requirements Report (PCN: N200684). The work order number 12014 was prefixed with a "5" and entered into the facility component field. **Figure 4** is a sequential log of work orders produced solely by the facility survey. The individual inputs all have the same priority and facility number. This allows the machine to print the work orders in sequence. The actual facility number, "17", is located in the contract cost field. All facilities covered by Work Order 12014 are grouped in one place. This portion of the "684" is now a control file used to see what work orders the facility survey has produced and helps in identifying inputs that must be deleted once the work is accomplished. **Figure 5** shows the same work order, 12014, in the Control Center / Work Center Work and Resource Requirements Report, or, for simplicity's sake, the shop file. In scanning this shop file, the In-Service Programmer can readily determine items previously accounted for and those new inputs that require some programming action. If the facility component field doesn't have a 12000 type number, it's a new requirement. The IWP Programmer may group his new work orders by scheduled quarters, i.e., second quarter grouping is created using priority 2. This gives him an idea of how his IWP schedule will look and, if in the current fiscal year, how well his current plan is performing. Because of the flexibility of this program, there are many combinations of alternatives.

We have seen how BEAMS can be used in part by everyone in civil engineering. There is a little of the action for everybody. BEAMS can "open the shades" on the individual work centers in Programs, Engineering, and Operations and Maintenance, showing how each must interact with the other to successfully meet the civil engineering goals. There is always some room for innovation in the use of the products. It may be just a small change, but can produce a big dividend. For instance, I invite the reader to find a copy of the BCE Work Order Backlog Report. In that report he will find a column with the heading "Date Open". While the age of a work order may be important, it is not the primary factor in determining when it will be scheduled. Rather than load the opening date in the "date open" field, load the estimated start date instead. (The Completed Work Order Cost Report can be manually updated to reflect the opening date.) With the estimated start date appearing in the "date open" column, the BCE Work Order Backlog Report takes on new meaning as a planning and programming document. A word of caution—BEAMS was created to provide a standard base level management system worldwide. Management procedures must be the same, but do not let the pendulum of standardization swing so far that you fail to see new uses for the system produced by small changes in the way we input data. A good tool has many uses, find them. The primary use of the hammer is to drive nails; it's also good for cracking nuts.

AFIT Offers Maintenance Management Course

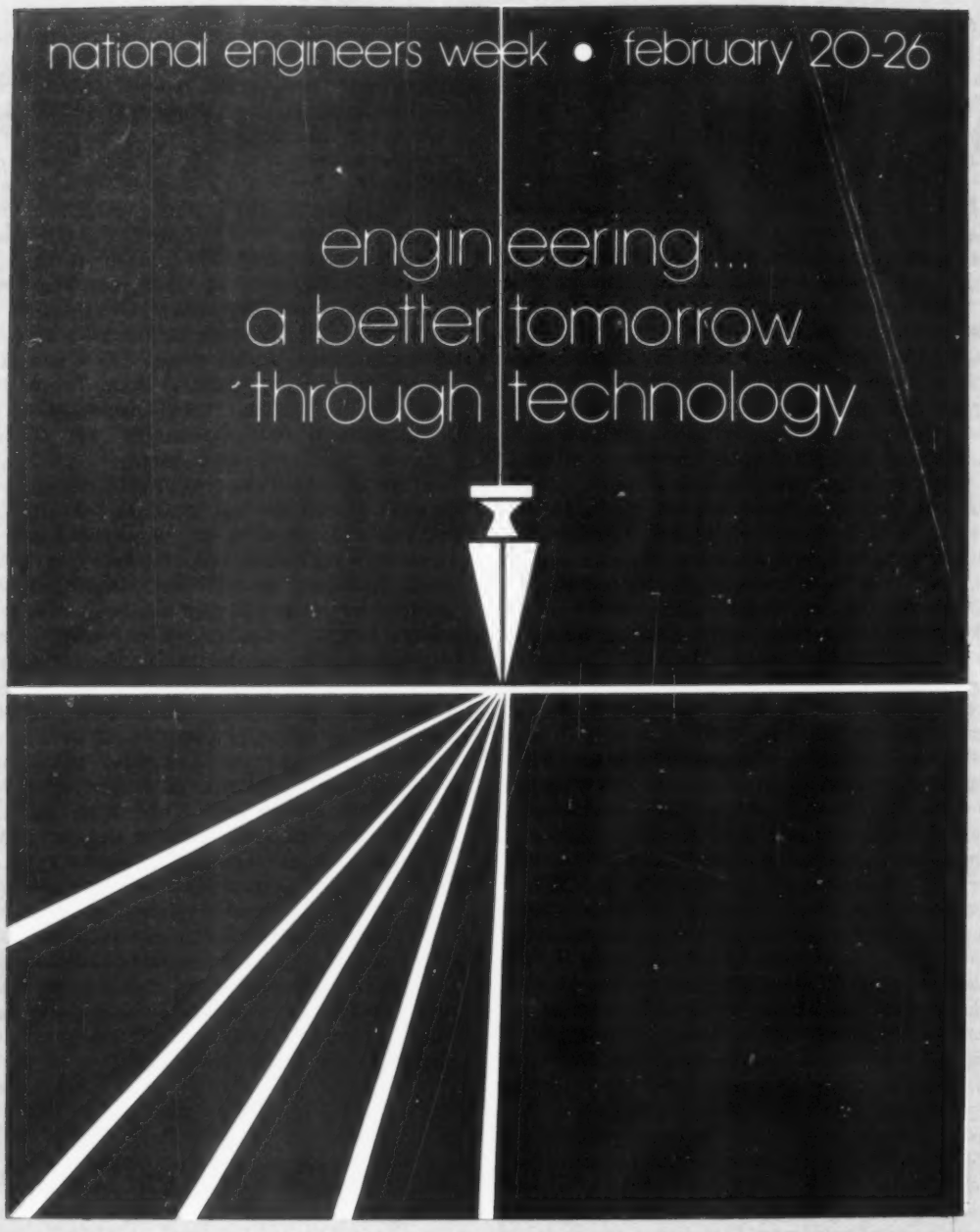
Maintenance of equipment in military organizations is rapidly becoming recognized as a keystone to the total ability of the organization to meet its mission requirements.

The Air Force Institute of Technology, School of Systems and Logistics, Wright-Patterson AFB, Ohio, is offering a one week Maintenance Management Orientation Course (242) which specifically is designed to provide a meaningful orientation to equipment maintenance for senior military and civilian personnel who are not managers.

The five class days provide coverage of maintenance policies and concepts in the Department of Defense (DOD) and participative involvement of the class members through discussion and simulation. Current maintenance problems, and their likely causes and possible accomodations are introduced for considerations relative to their effect on unit mission ability and / or unit economy of resource utiliazation.

The Department of Defense sponsored course is for military and civilian personnel of all agencies of the DOD. Criteria for attendance is established at the 0-5 / 0-6 level for military and the GS-13 / 14 / 15 level for civil service although requests for waivers, based upon job need, will be entertained. The program is outlined in detail, as are application instructions, in DOD Catalog 5010.16C, Defense Management Education and Training, available in training offices.

SCI & TECH
APR 5 1972



Awards to be Presented at Engineers Week Luncheon

The National Society of Professional Engineers, sponsors of the annual National Engineers Week observance, announced that the 1972 theme is "Engineering . . . A Better Tomorrow Through Technology." The 22nd National Engineers Week will be February 20-26.

The Directorate of Civil Engineering will again sponsor the Air Force Civil Engineering Day Luncheon to be held at the Officers' Open Mess, Bolling AFB, on 23 February. At the Luncheon, announcement is made of the military and civilian winners of the Meritorious Achievement Awards for Professional Excellence; the winner of the Air Force Civil Engineering NCO of the Year Award; and the Foreman of the Year Award.

The Air Force Association in conjunction with the Directorate, will present the Best Author Award to the author selected from a group of writers who have had articles published in the *Air Force Civil Engineer* journal during 1971.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1971—759-025/2